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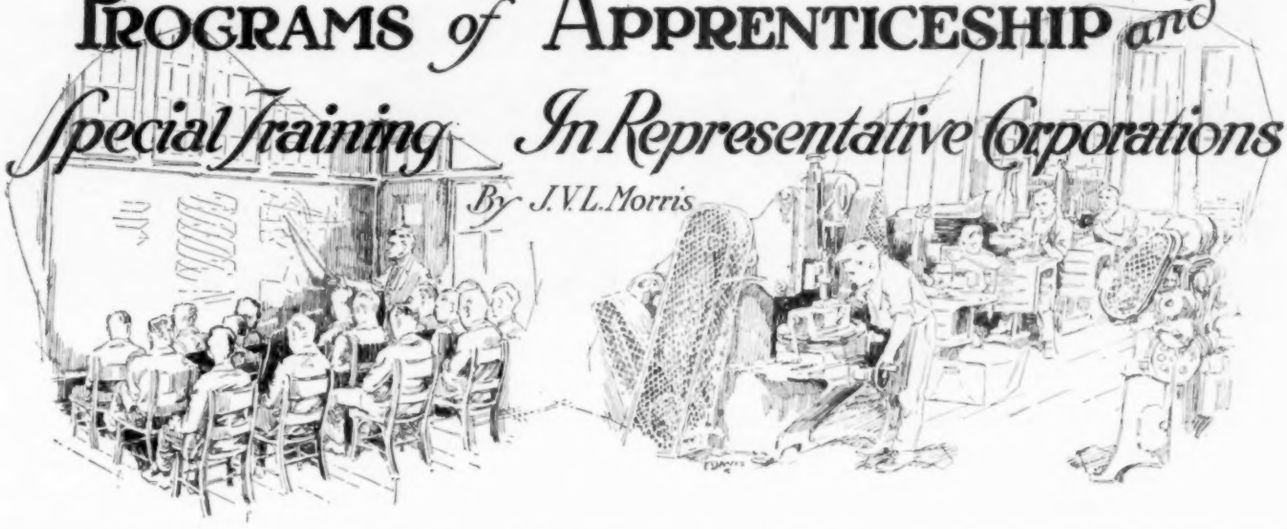
Programs of Apprenticeship and Special Training In Representative Corporations

By J. V. L. Morris



THE Schenectady works of the General Electric Co. is the largest plant of this important electrical manufacturing concern. Here are located the principal offices, research laboratories, and a manufacturing plant, each organized as a distinct unit, for the design and manufacture of electrical machinery and apparatus of nearly every description; of steam turbines of small, medium, and large capacity, and of many other mechanical devices of intricate design. Over 20,000 people are employed. The general management is committed to an established policy of apprenticeship and special training for all types of employment in the plant. There seems, however, to be considerable variation in the method of development of this policy in the various branches of the industry and to some extent in the different departments. The system may well be considered under six headings: (1) Apprenticeship, (2) graduate engineers' training, (3) foreman training, (4) instructor training, (5) intensive training, and (6) Americanization.

I. The General Electric Co., Schenectady, N. Y.

The subject of the systematic training of workers is becoming increasingly important. This is the first of a series of articles in which apprenticeship, as it exists today, will be comprehensively treated. The methods used in different representative machine concerns of various sizes will be presented and discussed, this article dealing with the system in use in the Schenectady plant of the General Electric Co. The different forms of training carried on and the various factors entering into the conducting of an apprenticeship program in the electrical manufacturing industry are fully considered.

Apprenticeship

Since 1901 a shop apprenticeship system has been in operation. To quote from the attractive announcement of the department: "It began with a systematized training in the various uses of machine tools. Later, night classroom work was added, which was subsequently changed to day classes." By the records of those who have completed the courses to Nov. 1, 1919, it will be noticed that the instruction has been confined mainly to three trades. (See table in left-hand column.)

Trade	No. Graduated	Per Cent of Total
Machinist	626	61 5
Draftsman	251	24 7
Molder and coremaker	129	12 7
Blacksmith	9	0 9
Tinsmith	2	0 2
Total	1,017	100 0

In connection with these statistics, it should be noted that tinsmithing or sheet-metal working is no longer offered as a field for apprenticeship and that, while blacksmithing is still offered, there are at present no apprentices. On the other hand, within the past three years apprenticeship in patternmaking has been introduced and there is a growing number of apprentices in this branch.

Statistics are not available telling the present positions held by the graduates, but the records of the company show that the most capable men are constantly being advanced to responsible positions. In the announcement of the apprentice system compiled in 1919, of the men still at the Schenectady works from the drafting course, twenty had received promotions to the following positions:

Designing engineer	1	Temporary foreman	1
Commercial engineer	1	Assistant foremen	2
Assistant engineer	1	Division leaders	12
Section chief	1	Assistant division leader	1

Of those who had completed the courses for machinists and blacksmiths, some fifty are enumerated as follows:

Foremen	8	Tool designers	13
Assistant foremen	9	Tool inspector	1
Gang foreman	1	Shop instructors	5
Sub-foremen	10	Group leader	1
Designing draftsmen	2	Following special turbine work	1

The organization of the instruction department is typical of an efficient apprenticeship and training plan. In charge of the department is a superintendent, who has himself been apprentice trained, with a long practical experience, coupled with a good general education

FIG. 1. LATHE SECTION OF APPRENTICE TRAINING ROOM

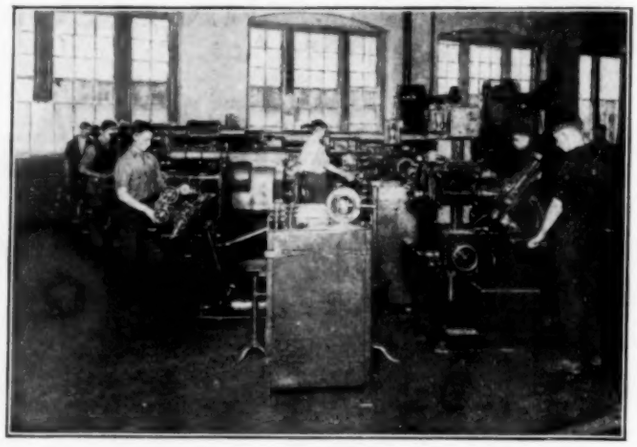


FIG. 3. MILLING-MACHINE AND GEAR-CUTTING SECTION OF APPRENTICE TRAINING ROOM

and a strong human interest in the boys under his charge. He has direct control of the shop training department, which is elaborately equipped with all varieties of standard machines and provided with a staff of five machinist instructors, all apprentice trained. Figs. 1, 2 and 3, give a good idea of the equipment of this department, and they show apprentices at work. Here ordinarily the apprentice machinists and draftsmen spend at least one year of their training, both in learning to operate all types of machine-shop equipment on actual production and in doing bench and floor work. There is suitable supervision of transfer from machine to machine, so that each man gets an opportunity to do all kinds of work.

In conjunction with this is the apprentice school, which has four instructors and which machinist, patternmaker and draftsman apprentices are required to attend three sessions a week during working hours—the sessions being from an hour to an hour and a half in length.

Applicants for entrance as machinists and patternmakers must be between sixteen and eighteen years of age. They must have good habits, be of respectable parents and able to speak, read and write English. It is also considered desirable that apprentices come directly from school, as it is found, to quote the superintendent, "that such boys have not lost habits of discipline, obedience, and study." For the four-year drafting course the requirements are identical to those stated above, while to enter the three-year course graduation from high school is invariably required, and satisfactory samples of the high-school work in mechanical drawing must be submitted. Not much, however, in the way of academic education is apparently expected of molders, although they are given an examination in common fractions, and they report for class instruction only one session a week. Only young men eighteen to twenty-one years of age and strong physically are accepted for this trade.

The course of study for machinists and patternmakers, as outlined in the announcement, seems to be a rather formal review of school arithmetic with some algebra and geometry and a course in mechanical drawing, one plate of which is to be completed each month at home. Fig. 4 shows a class in mechanical drawing in session. Two class sessions a week are devoted to mathematics and mechanics and one to drafting. For home preparation a schedule of problems and drawing is assigned, which is expected to require about four hours a week of study.

The four-year drafting apprentices spend their first year in the blueprint and tracing departments and their second year doing mechanical work in the machine-shop training department, the foundry and the pattern-shop. Fig. 5 is another picture of apprentices at work, while Fig. 6 shows some apprentices and the class of work that they turn out. The three-year apprentices in this field enter upon the mechanical work in their first year. The two final years in each case are spent in the drafting departments with two weeks in the

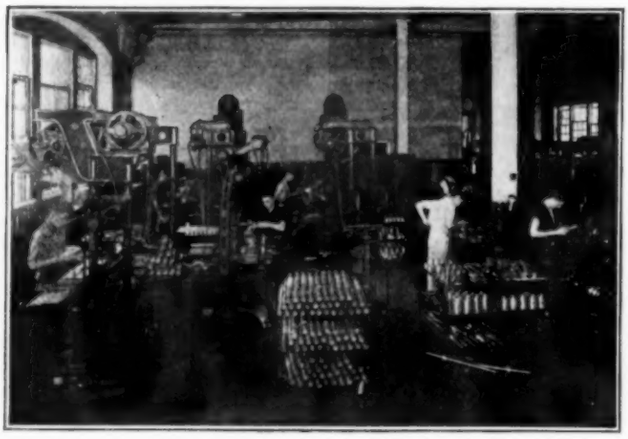


FIG. 2. GRINDING-MACHINE SECTION OF APPRENTICE TRAINING ROOM

FIG. 4. A CLASS OF APPRENTICES IN MECHANICAL DRAWING

FIG. 5. SHAPER SECTION OF APPRENTICE TRAINING DEPARTMENT

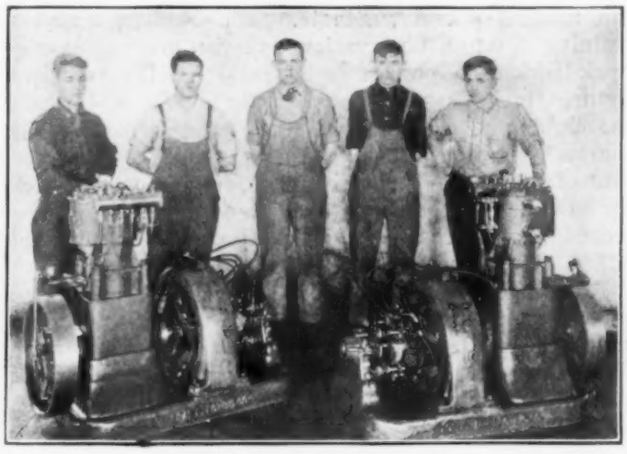


FIG. 6. MARINE SETS BUILT COMPLETE, EXCEPT FOR GENERATORS, IN APPRENTICE TRAINING DEPARTMENT

physical testing laboratory during the last year. For classroom work algebra, plane geometry, solid geometry, trigonometry, descriptive geometry, mechanics and strength of materials with laboratory work are substituted for the more elementary mathematics of the machinists' course.

RATES OF PAY—During the past two years remuneration has more than doubled. In 1917 the rate of pay for machinists ranged from eleven cents an hour for the first year to eighteen cents during the fourth year. It now ranges from twenty cents to thirty-six cents per hour. A premium of two cents an hour is also paid for good records in class and shop. Finally, a bonus of $100 is paid at the conclusion of apprenticeship. For draftsmen the same improvement in pay is to be noted, the rate now ranging from twenty cents an hour for the first year to forty cents for the fourth year, and similar regulations hold as to premiums and the final bonus. High-school graduates start with the second-year rate of twenty-six and one-half cents. For molders the pay is twenty-one cents an hour the first year, twenty-six and one-half cents the second year, thirty cents the third year, with minimum journeyman's rate (now ninety cents an hour) for the fourth year, and a bonus of $50 is paid when the certificate is conferred. It should be noted in connection with all the trades already referred to that indentures are in each case entered into between the company and the young man, together with his parents.

GENERAL ELECTRIC COMPANY

SCHENECTADY WORKS

Certificate of Apprenticeship

Granted to

In recognition of the satisfactory termination of a _____ *year course of* PRACTICAL TRAINING *as a*

_____

Said apprentice has also received classroom instruction as provided by the Company

_____

Schenectady, N. Y. _____ *19*__

FIG. 7. CERTIFICATE GIVEN AT COMPLETION OF APPRENTICE TRAINING

At the satisfactory completion of the term of apprenticeship a certificate is conferred, a copy of which is shown in Fig. 7.

TRAINING IN THE TESTING DEPARTMENT FOR ENGINEERING STUDENTS.—There are two distinct groups receiving training in the testing department by doing the regular work of that department. The first group is made up of high-school graduates, the second in the main of college graduates in electrical engineering but also of men who have successfully completed the work laid out for the first group.

In the first group there are at present seventy-five enrolled in what is called a "preliminary course," which to some extent approximates apprenticeship as electricians. Their course is normally two and one-half years in length, though a man may materially reduce the time required to cover it if he displays unusual ability. The practical work consists of measuring work during the first year, with work as assistants in testing during the remainder of the course. Instruction, in which a standard electrical textbook is used, is given once a week with monthly quizzes. The management of the department emphasizes the fact that each boy being trained is considered individually upon his own merits. It is evident that young men undergoing this training have large opportunities to learn by observation, as well as by the book instruction and the practical work performed. The pay starts at thirty cents an hour, or $17.60 a week, with normal increases of four cents an hour every six months. At the end of this informal apprenticeship the young men pursuing the course are given an examination and, if they pass successfully, are admitted to the regular test course for engineering graduates.

In the test course open to the second group there were 377 student engineers during 1919, coming from the leading technical schools both in this country and abroad. Ordinarily the student spends a year at this work, this corresponding to the year of interneship of

the medical school graduate. The student acquires training through observation and the practice in the work which he performs, but also by the technical lectures and discussions constantly available through the club to which he is admitted while pursuing the course. The pay of these student engineers is at the rate of fifty cents an hour for a forty-nine-hour week for the first six months and fifty-five cents for the second six months, which figures out at $24.50 and $27.50 per week for the respective periods.

From the standpoint of the company, this course serves two purposes. It provides a large corps from which the departmental heads may select recruits for their respective departments, and it familiarizes the student engineers with the products of the company, so that they will be in a position to utilize them even though they enter the employ of other companies at the end of their year of training. To what extent and in what field the company absorbed these men may be gaged from the following summary of transfers occurring in 1919:

Total number of men engaged for the year 1919	304
Total number of men leaving the testing dept.	209
Of these there were transferred to commercial dept.	44
To engineering dept.	48
To construction dept.	6
To factory dept.	7
To district offices	8
Total remaining with the company	113
Leaving to accept position with other companies	77
Miscellaneous (dropped, discharged, leaving on account of health, resigned, etc.)	23

This shows that about 55 per cent of those finishing the course accepted permanent employment with the company, which conforms to the condition shown by the records of recent years. Mention should also be made of the seventy-three engineering students, who in the summer of their junior year were employed in this department.

Foreman Training

As a step in the comprehensive scheme of systematic training for all employees entering the plant, and for "upgrading" those being advanced to improved positions, there have this year been organized classes for foremen, meeting once a week for an hour and a half and extending through fifteen to twenty weeks. Since the completion of the first groups the plan of having them meet daily is now being tried, so that the series concludes in five weeks' time. This plan seems to be more favorably received than the protracted course, as it permits closer connection of the units of the series. Upon this basis the director is handling three groups simultaneously.

These classes are composed of general foremen, foremen, assistant foremen and sub-foremen, and are limited to twelve in each group so as to provide for free discussion. An average of 85 per cent in attendance was maintained, which is satisfactory when the difficulties of assembling the administrative force of a large plant are considered. The practice is to limit the attendance in each section to not more than two men from any one department, so that the discussion will be general rather than of special departmental problems.

The course seems to be a combination of what might be called labor psychology with an analysis of the duties of foremanship. The following topics are typical; handling men through leadership, interest and job pride; carelessness, temporary and persistent; safety; health and hygiene; production and managerial phases; machines; records and reports; job analysis; man analysis; tying up man and job.

The next step planned is to organize training classes for instructors in special and intensive training for the important types of semi-skilled and specialist employment. For these intensive full-time courses a length of four or five weeks is planned. They will consist of a careful analysis of all the operations involved in the plant and of the difficulties to be overcome in teaching them to the beginner, to the end that his time of inefficient production may be shortened as much as possible.

Intensive training is now provided in several departments. It is not at present the policy to provide a "vestibule school," that is, a training department distinct from that used for regular production. Instead, training is provided on the regular production floor and at the regular machines, either the foreman or an experienced workman giving the instruction. Thus, for example, armature winders are trained to the skillful manipulation of their machine until the qualities of uniform winding and a reasonable speed are attained.

Americanization

The final phase of training and education in the works is found in the field of Americanization, in teaching English and in giving civic training to alien employees. A department was organized for this purpose, which early in the past winter completed a survey as its initial step. Of the total employees 6,200 were found to be foreign born. Of these 2,000 were illiterate in English and 700 in both English and their native language. Forty volunteer teachers were enlisted and classes arranged to meet twice a week for one hour at 4:30 p.m., just after the day shift stopped work, or at 7:30 p.m., just before the night shift started.

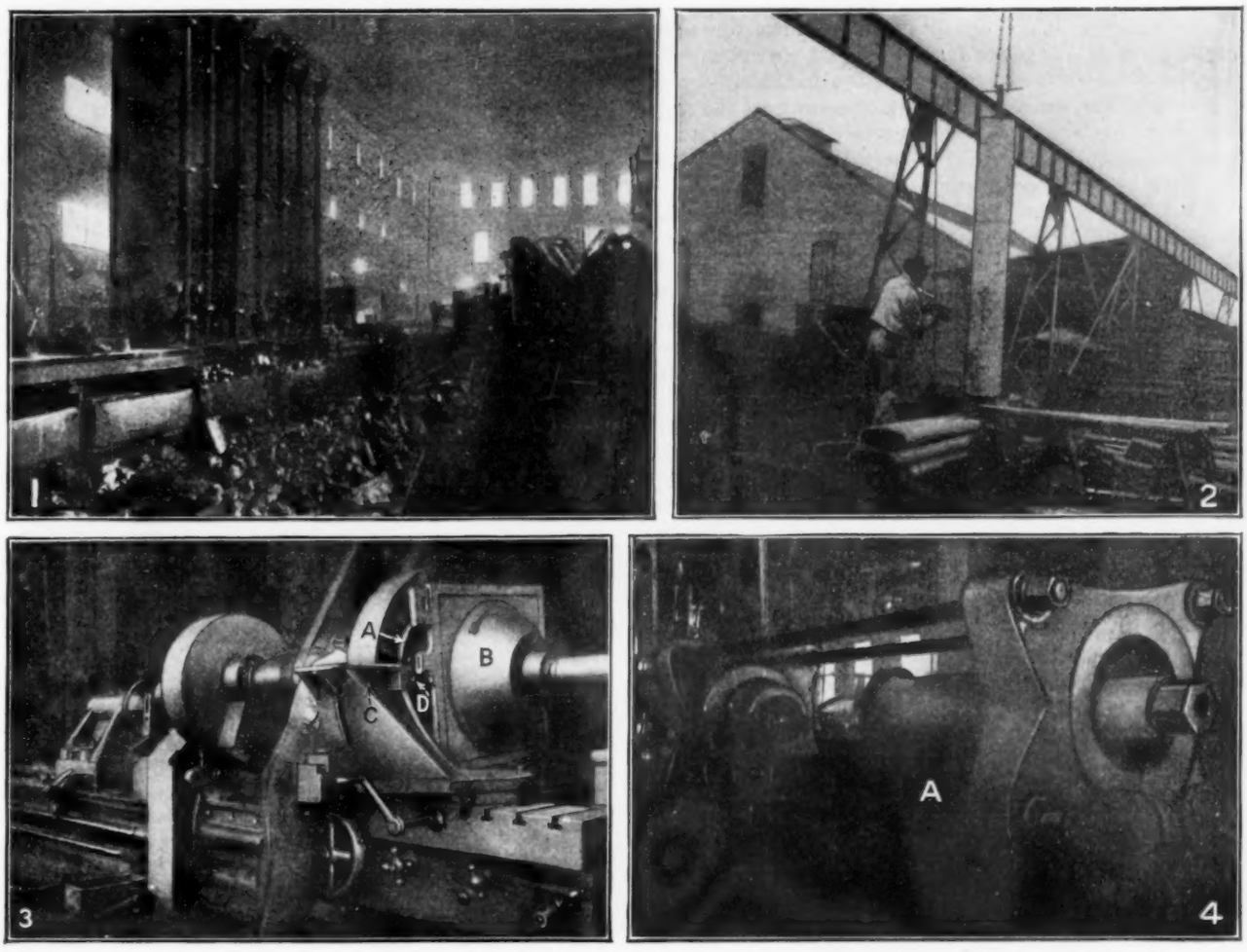
The places of meeting were throughout all sections of the works. A partitioned-off recitation room was not considered essential, a blackboard and seating benches which would collapse against the wall being the only equipment installed. This saves loss of time in going to recitation rooms not readily accessible, reduces the inconvenience to both instructors and students to the minimum and insures that the attendance be as regular as the attendance at work. At the conclusion of the series of classes held, about 800 men have obtained or are applying for their first and second papers. The department is offering them all assistance possible, providing them with conveyance to the court for going through the formalities, and in conferences clearing up by explanation the difficulties which naturally arise. This part of the program is being carried through at the rate of about sixty men a week.

Odd Jobs in a New Orleans Shop

Special Correspondence

The shop of Dibert, Bancroft & Ross, New Orleans, La., always has interesting methods by which it solves the many problems which are presented to it from time to time. Much of its work is sugar-mill machinery and large engine-room fittings, while occasional jobs of structural castings also come its way. This means that it must be prepared to handle almost anything in the way of foundry and machine work.

A somewhat unusual foundry job is shown in Figs.



FIGS. 1 TO 4. SOME OF THE ODD JOBS
Fig. 1—Drying molds over fire. Fig. 2—Cleaning castings under the crane. Fig. 3—A double facing tool. Fig. 4—Heating work for press fits.

1 and 2. Fig. 1 shows a method of drying the molds for the castings shown in Fig. 2. The castings are practically flattened cast-iron tubes of which a large quantity are made. The molds shown in Fig. 1 are being dried out over a coke fire built in the pans beneath the platform on which they are placed. The molds are located by dowel pins so as to bring their openings over corresponding openings in the platform which allow the heat to pass freely up to the molds.

Fig. 2 shows the way in which the castings made from these molds are cleaned in the foundry yard. The runway is one side of the craneway which runs from the foundry out over the yard. The castings are held suspended as shown, and the sand knocked out of them, as well as the rough spots chipped off.

One of the jobs which occurs quite frequently is that of making platform plates either for sugar-mill machinery or similar purposes. In order to true up the raised edges of these plates and at the same time keep their sides true the plates are held between large cupped surfaces, as shown in Fig. 3. One of the cups *A* is bolted to the faceplate of the lathe and the other cup *B* mounted on an easily revolving bearing on the tail spindle. With the plate clamped in position it is only necessary to feed the cutting tools down the sides until the entire raised edge has been faced. The tools are simply arranged in the holder *C*, which has a U-shaped opening at the top carrying a tool on each side. This in reality forms a double toolpost in which the tools are easily held as at *D*.

As an emergency proposition, the pressing on of a heavy hub which was heated in place on the press is interesting because of its being unusual. An idea of this is shown in Fig. 4, which shows a heavy press of special construction and a wood fire was built at *A* under the hub when it was in place in the press. The fire was built on a heavy plate so as to disturb the bed of the press as little as possible.

Making a Cylindrical Shell with Two Internal Flanges

By E. A. Dixie

The illustration, Fig. 1, shows a sheet-brass part made in three operations on the punching machine. Formerly, these pieces were made partly on the punching machine and the final operation in the spinning lathe.

As shown in Fig. 2 the first two operations are simple everyday ones; no time will be wasted in describing the tools with which they were performed.

The part *A* shows the work as it comes from the first operation dies, just an ordinary cupping and blanking operation in which the piece is blanked, cupped and pierced on the bottom in a combination die.

The second operation is shown at *B*. The upper half

of the vertical flange has been closed inwardly to an angle of about 20 deg. from the perpendicular. For this the blank from the first operation is held in a plain cup-shaped die while a punch in the form of a female cone descends and closes the vertical flange to put the work in shape for the third operation. At *C*, Fig. 2, the work is shown completed.

Six pieces of flat steel, $\frac{3}{4}$ in. thick, are made the shape of *D*, *E*, *F*, *G*, *H* and *I* Fig. 3, respectively, but slightly oversize. The toolmaker is careful to see that the edges are square with the sides. A plug is then turned between centers and milled or shaped square on the shank as shown at *L*. The pieces *D* to *I* are then assembled around the shank of *L* and, when properly fitted, are tinned and carefully soldered to each other and to the flange and stem of *L* which has also been tinned. The whole assembly is then put in the lathe and the pieces turned to size on their circumference, and the edges slightly rounded over so that they will not mar the inner surface of the work. After unsoldering from the plug *L* both the pieces and the plug are hardened and tempered so that a smooth Swiss file will just "take hold."

The opening in the die *J* is made about 0.002 in. larger than the work from the second operation. The die *J* is turned on the outside about $\frac{1}{32}$ in. smaller than

FIG. 1. THE SHELL WITH TWO INTERNAL FLANGES

the cylindrical hole in the bolster *O*. On work of this character it is well to make the dies and punches heavy wherever possible as the closing of the work is done just as the crank goes over the bottom center, and the pressure is apt to be greater than most of us estimate. This being the case, dimensions *M* and *N* should be ample for the work demanded of them. As the inner loose pieces and the plug are subjected on all sides to stresses, the stresses are more or less balanced but, as the dimensions of the loose pieces cannot be anything but those determined by the size of the work, all we have to worry about is to see that the material is right and hard and tough enough.

The opening in the die *J*, for the square stem on the spreader plug *L*, is round and considerably larger than the size of *L* across the corners. The cylindrical head of *L* can be made any size so long as it is larger than the square stem and smaller than the hole in the work after the edges *B* have been closed over.

The punch for this operation is shown at *P*. It is a plain cylindrical punch with a recess in the face to permit the cylindrical head of *L* to enter when the punch *P* is in its lowest position. The face of *P* is flat and should be finished smooth so that the edges *B* of the work will readily slide inward when the punch is forming the internal flange.

The operation is as follows:

The die *J* is lifted out of the recess in the bolster *O*. A cup *B* from the second operation is placed in it with the angular flange upward. The sectional pieces,

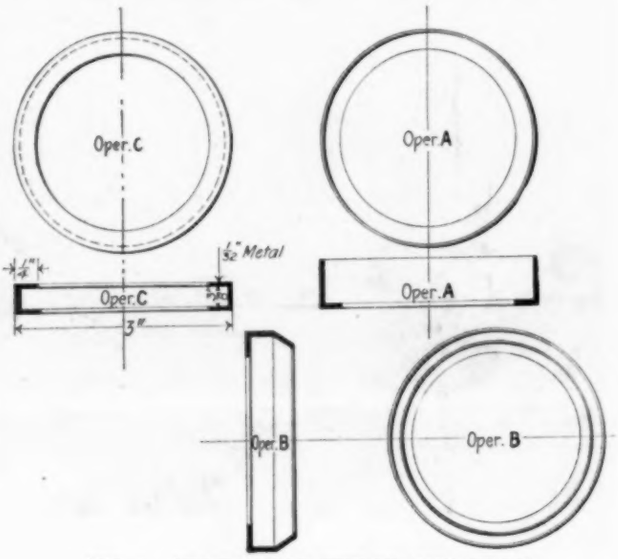


FIG. 2. SECTIONS OF THE BLANKS FROM THE THREE OPERATIONS

D and *E*, and *H* and *I*, are slipped into place, after which the locking pieces *F* and *G* are placed. The spreader plug *L* is now placed and the whole assembly is put back in the bolster *O*. The press is now tripped and the punch *P* descends and flattens the flange of *B* on to the sectional pieces *D*, *E*, *F*, *G*, *H* and *I*. When the punch *P* ascends to top position the assembly is turned 180 deg. in the bolster *O*, the press is tripped again and work subjected to another blow. The assembly is now removed from *O* and turned over to cause the spreader plug to drop into the operator's hand. Either sectional piece *F* or *G* is slid toward the central square opening *K*, previously occupied by the plug *L*, and taken out, after which the other one is taken out. This releases the other pieces *D*, *E*, *H* and *I* so that they can be taken out. The operation is then repeated.

While the operation of forming the flange is much slower than either of the preceding operations it is much faster and produces more uniform work than was possible when the spinning method was employed.

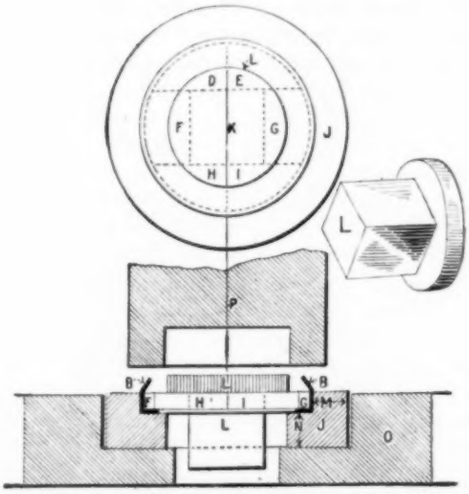
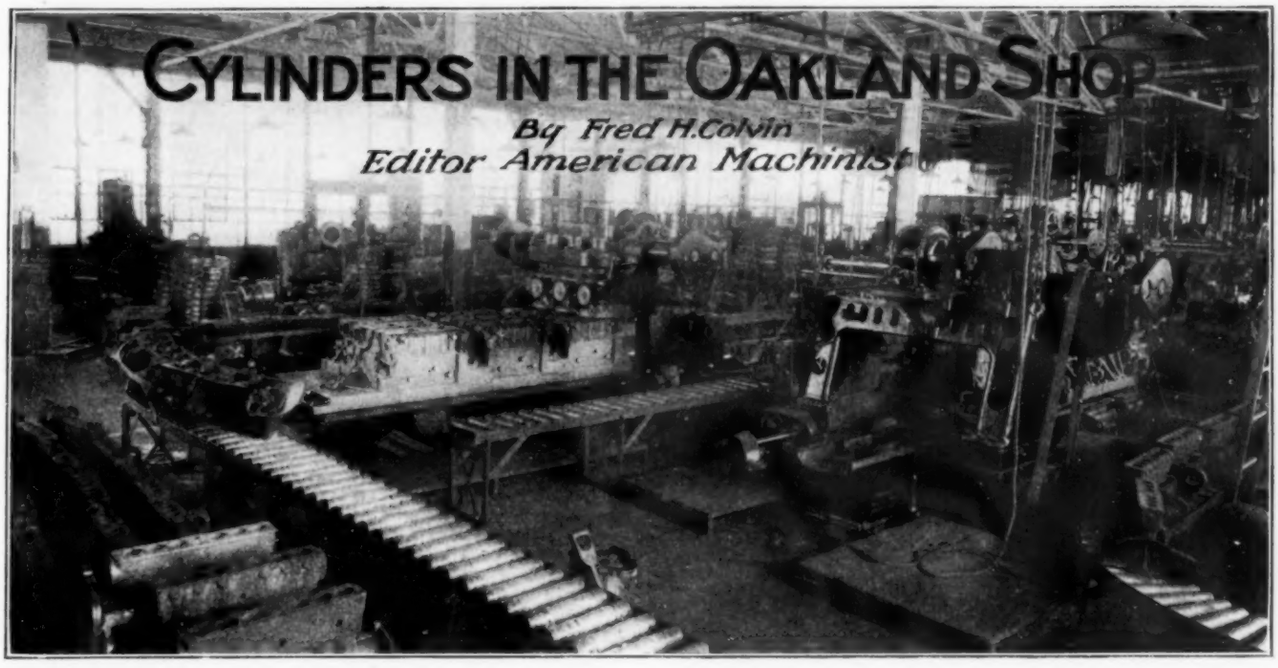


FIG. 3. PUNCH AND DIE FOR THE LAST OPERATION



A GENERAL view of the layout of the cylinder department in the shops of the Oakland Motor Car Co., Pontiac, Mich., can be had from the headpiece of this article. This view shows the liberal use of the roller type of conveyor and the general appearance of the Ingersoll milling machine used especially for this work. The operations are shown in Fig. 1, the blank triangles showing how the piece is held. The machine at the left in the headpiece is performing the first operation, which is that of surfacing the lower side, before the drilling of the cylinder block. This shows the type of fixture used, while Fig. 2 gives a detailed view of the three cutters used in the work. The top of the cylinder block is next milled, as shown in Fig. 3. This also shows the four supporting pins in each fixture as at *A*. It also shows adjusting fingers or stops at *B* for setting milling cutters on different kinds of work. The blocks then go to the machines shown in the headpiece and in detail in Fig. 4.

This article describes the operations on the cylinders of a small six-cylinder motor in which the cylinder block can be readily handled and for which some interesting tools and fixtures have been designed. The removable head carrying the valves makes a somewhat different machining problem than is usually found.

The fixtures are very substantial, having an angular base *A*, so as to make it possible to mill the surfaces surrounding the timing gear pocket with as small a diameter milling cutter as possible. At the same time the surface which supports the cooling fan is also milled. Substantial clamps *B* are provided, together with the

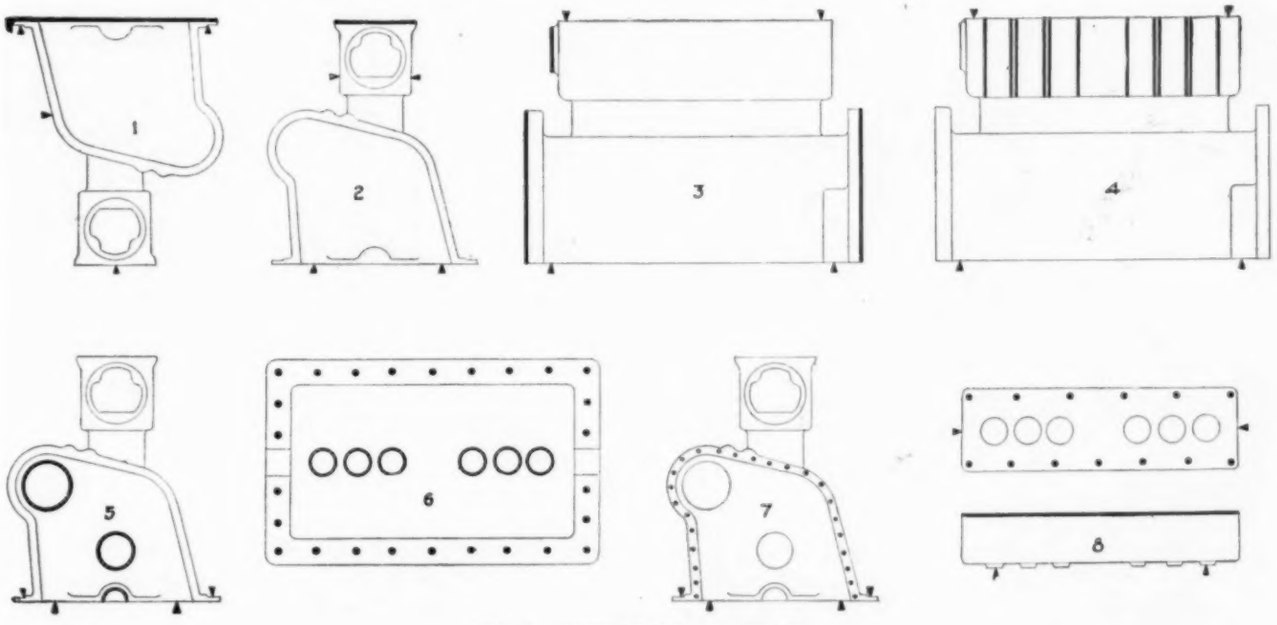


FIG. 1. OPERATION DIAGRAM

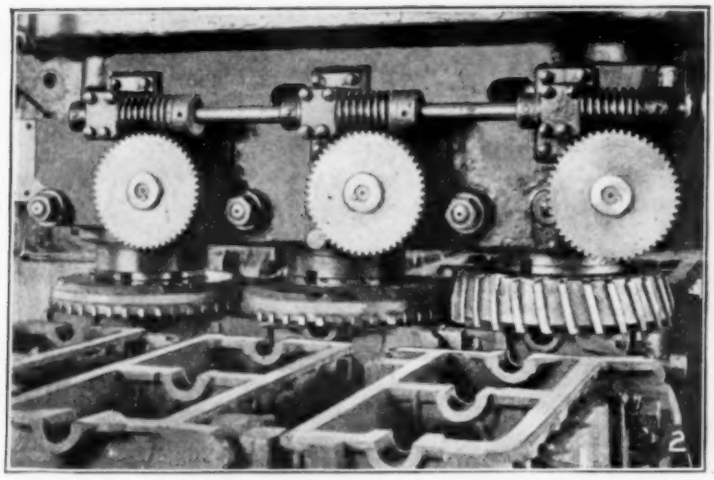


FIG. 2. MILLING THREE ROWS OF CYLINDERS AT ONCE

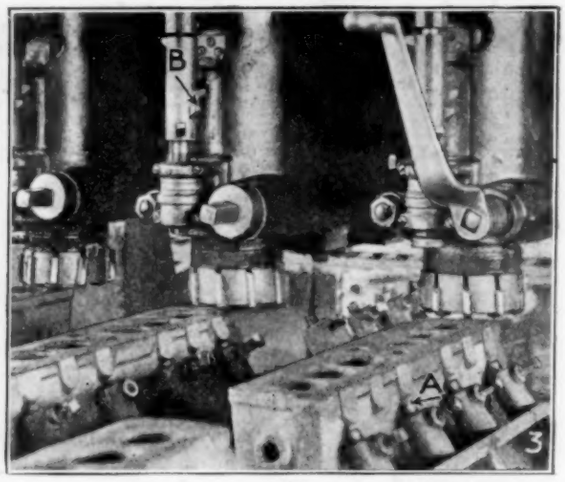


FIG. 3. MILLING TOPS OF CYLINDER BLOCKS

supporting pins *C*, which are adjusted so as to contact with the cylinder casting and prevent springing under the thrust of the milling cutter.

The cylinder boring and reaming is done on Foote-Burt machines, as shown in Figs. 5 and 10. The lower or base flange of the cylinder rests upon the hardened steel pins *A*, Fig. 5, the top being held by the clamps *B*, which are pivoted at *C* and forced down by the screws *D*. The carriage is counterweighted, as can be seen. The rod in front controls the supporting plates which, when the cylinder is in place, are dropped to permit the casting to rest on the plunger beneath and to be located by the dowels.

Boring and Reaming of Holes

The boring and reaming of the holes for the crankshaft, camshaft, starter and generator, are done in the special fixture shown in Fig. 6. The cylinder block is mounted in a substantial fixture located by dowels, and firmly clamped as shown. Special boring bars suitably guided and provided with convenient feeding mechanism, make it an interesting operation. The boring machine merely furnishes power for driving the various boring bars.

The fixture for drilling the base flange of the cylinder block is shown in Fig. 7, as well as part of the drilling head of the Natco multiple-spindle drilling machine. As will be seen, the plate carrying the bushings is deeply ribbed so as to combine strength and lightness.

The ends are drilled in a double-ended Baush multiple-spindle drilling machine, as shown in Fig. 8, the casting being located and held in the usual manner.

The tapping of the cylinder flange holes for studs is also done on a similar drilling machine, as shown in Fig. 9, no fixture being necessary, as it is easy to position the cylinder block against stops on the drilling machine table.

Cylinder Reaming

The cylinder reaming is done on a machine of the same kind as that used for boring, the only difference being the absence of elaborate fixtures, as it is only necessary to position the cylinder block so as to bring the reamers in line with the holes already bored. As shown in Fig. 10 the cylinder rests on four parallel strips, and it is interesting to note the blocks in front of these strips which are made from an I-beam.

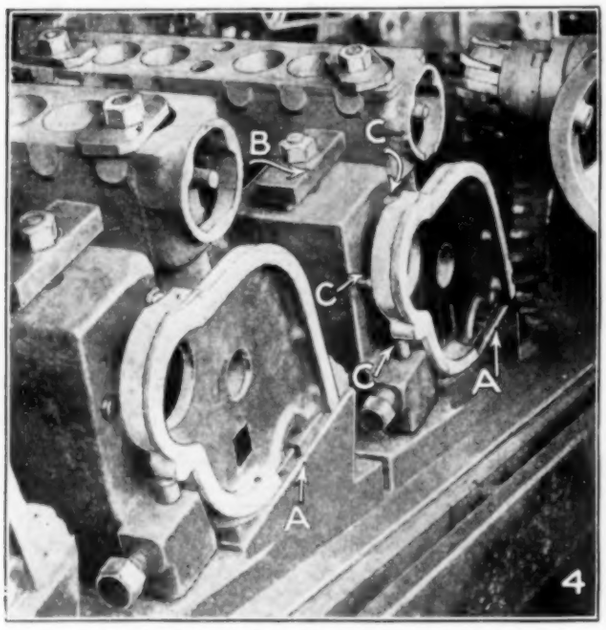


FIG. 4. HOW THE ENDS ARE MILLED

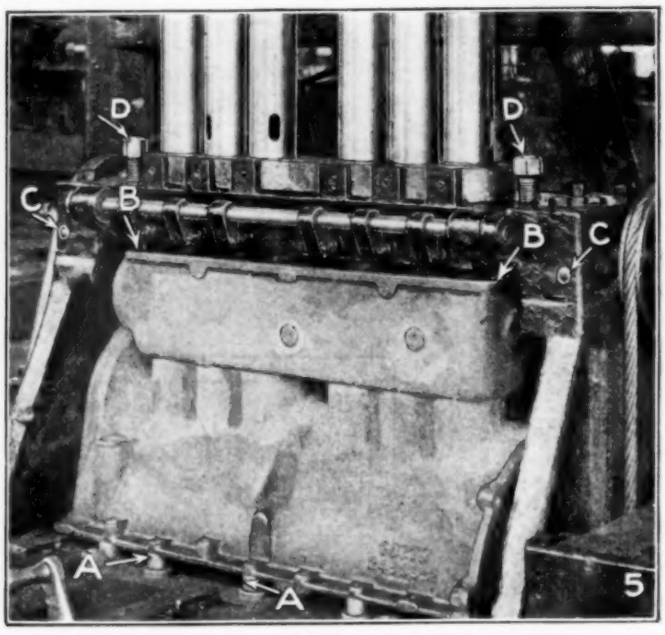


FIG. 5. ROUGH BORING THE CYLINDERS

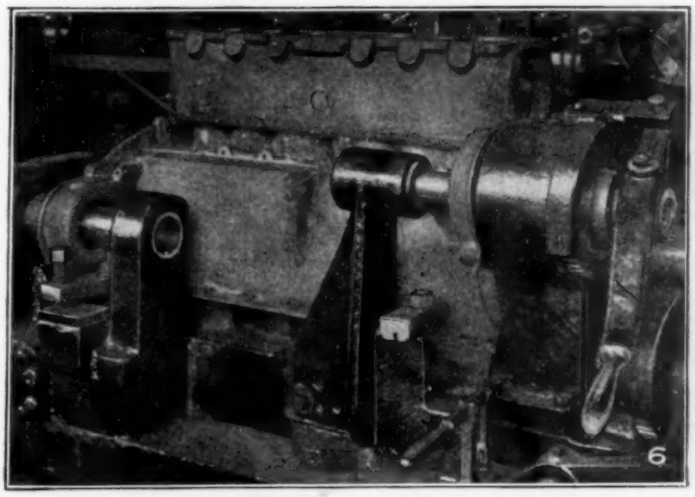


FIG. 6. REAMING THE CRANKSHAFT, CAMSHAFT, STARTER AND GENERATOR HOLES

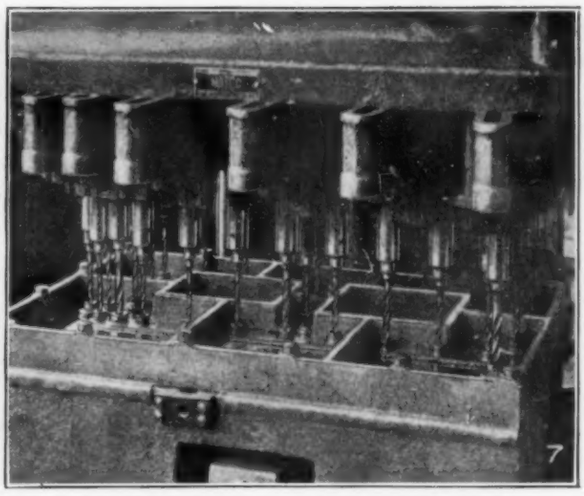


FIG. 7. DRILLING THE CYLINDER FLANGE

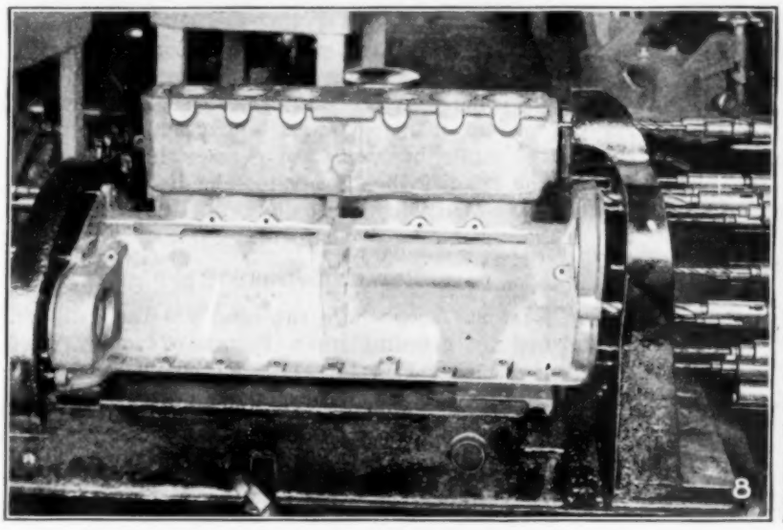


FIG. 8. DRILLING BOTH ENDS

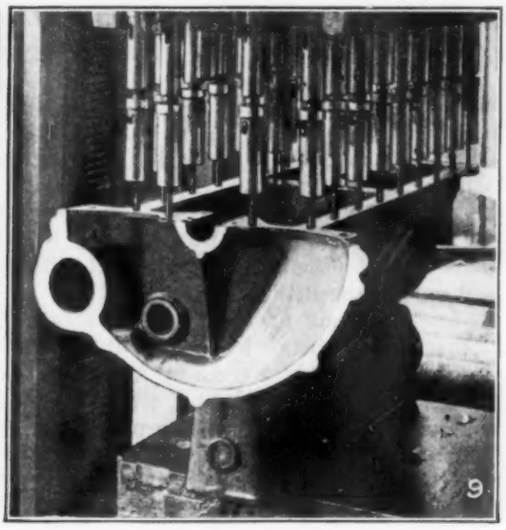


FIG. 9. TAPPING CYLINDER BLOCK

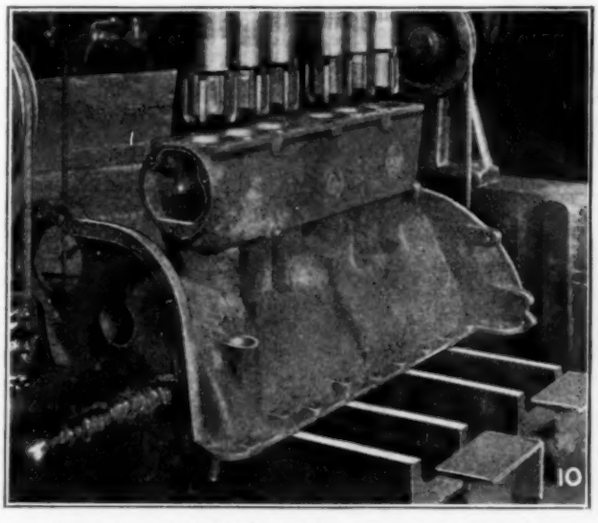


FIG. 10. FINISH-REAMING THE CYLINDERS

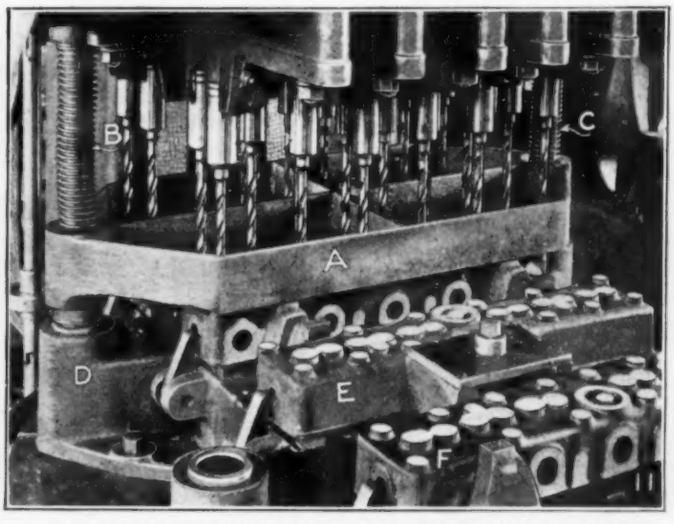


FIG. 11. DRILLING BOLT HOLES IN CYLINDER HEAD

This is a valve-in-the-head motor, which makes a somewhat different construction than the usual removable head. First come the usual milling operations, in which string jigs are employed. Then follows the drilling of the bolt holes which involves the use of a Natco multiple-spindle drilling machine and a double revolving fixture, so that two heads are drilled at the same time, as shown in Fig. 11.

This illustration shows the method of locating and clamping the cylinder heads, and also that the guide

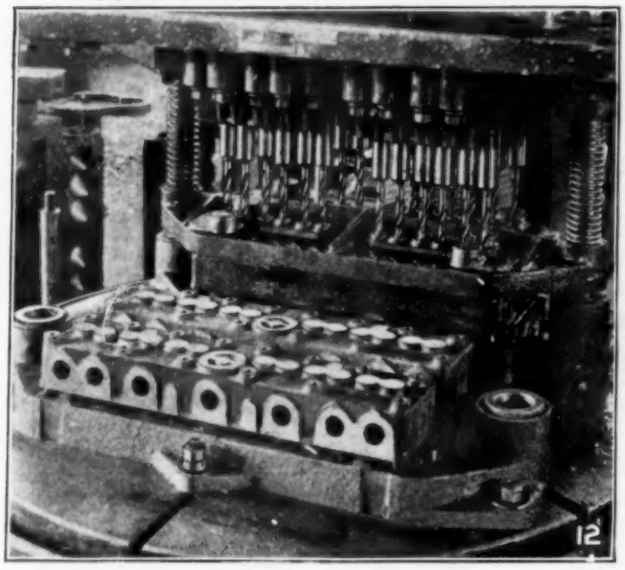


FIG. 12. DRILLING VALVE GUIDE HOLES IN HEAD

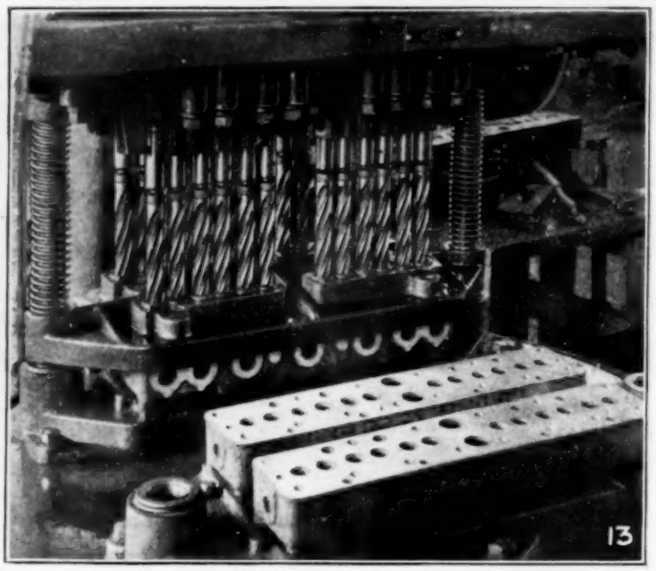


FIG. 13. DRILLING THE VALVE HOLES

plate *A* is carried on the drilling head and guided on the rods *B* and *C*. These rods project from the bushing plate sufficiently to enter the locating holes in the fixture itself, as at *D*. The springs allow the plate carrying the drill bushings to slide up on the guiding rods as the drills feed through the work, and also insure the plate being held in contact with the cylinder head during the drilling operation.

While one pair of cylinder heads is being drilled, another pair is being loaded, as at *E* and *F*, and can be readily swung into place by means of the turntable, or indexing fixture, so that the finished pieces may be removed and new ones put into place.

Another very similar fixture for drilling the holes for the valve guides is shown in Fig. 12. The same idea is also shown in Fig. 13, in which the cylinder heads are placed face up so that the valve holes can be readily drilled in their proper position.

The method of reaming the valve holes and the valve-stem guide holes at the same time is shown in Fig. 14. No guides are necessary, and this also shows how the smaller reamers used for the valve-stem guides are fitted to the large reamers for the valve holes, in the same way as the taper shank drill is fitted to a drilling spindle or collet. After this comes the final drilling for the various manifold studs and other connections, then valve guide bushings are pressed in as in Fig. 16 and the head is then ready to take its place in the procession, which will eventually bring it to the cylinder in the assembling department.

Rotary Grinding

The joint surface, where the head fits the cylinder, is finished by grinding on a Blanchard rotary table grinding machine, Fig. 15. This method is an indication of the way in which former prejudices in regard to rotary grinding have been overcome. Being accustomed to seeing the grinding marks run parallel to the surface of the piece, they were not considered as scratches, and the natural inclination upon the introduction of rotary grinders was to criticize the work on account of the apparent scratches, which were circular instead of being straight. This prejudice has fortunately been overcome, and the use of a cup wheel has become one of the standard methods of finishing flat surfaces. The growing use of the magnetic chuck has also aided along this line, and has made it possible to secure extreme accuracy at a minimum cost.

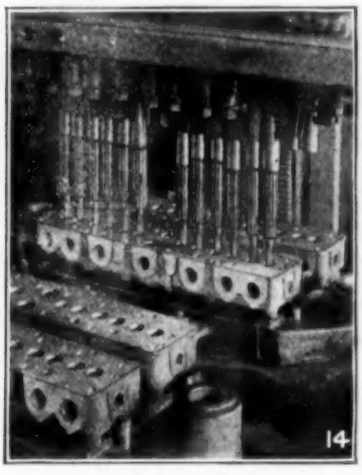


FIG. 14. REAMING VALVE AND VALVE-STEM GUIDE HOLES

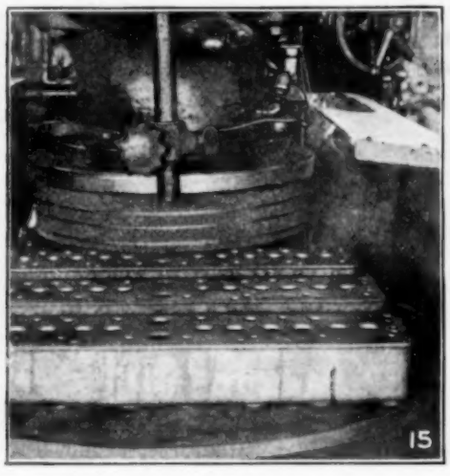


FIG. 15. GRINDING FACE OF CYLINDER HEAD

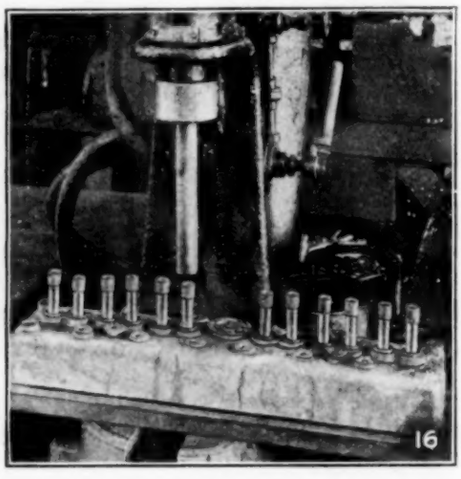


FIG. 16. PRESSING IN VALVE-GUIDE BUSHINGS

The Studebaker Methods of Cylinder Production

This article describes the methods of a large producer of medium-size six-cylinder motors. Some of the tools and fixtures illustrated are of particular interest. Coupled with the fact that the motors shown are built in crowded quarters, the handling methods as well as the production are both interesting and the results are extremely creditable.

THE transformation sheet, Fig. 1, shows the sequence of operation. The first machining operation on the cylinder block is to mill the three sides, as shown in Fig. 2. The upper end of the cylinder is located on the steel block *A*, while the flange is held

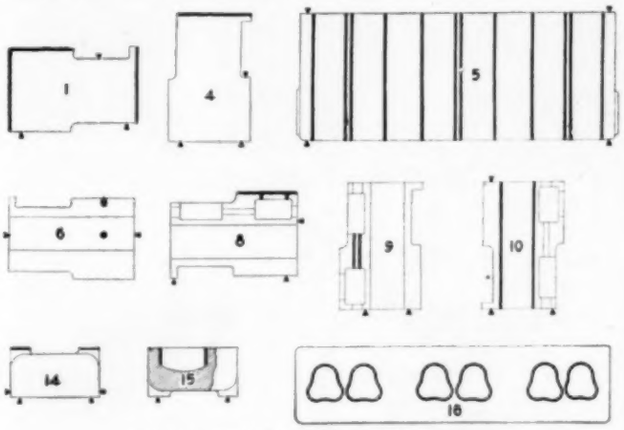


FIG. 1. TRANSFORMATION SHEET

against the face *B*. The clamping bar *C* is of H-section and when swung down into the position shown is held by the pin *D*. The screw *E* holds the cylinder block.

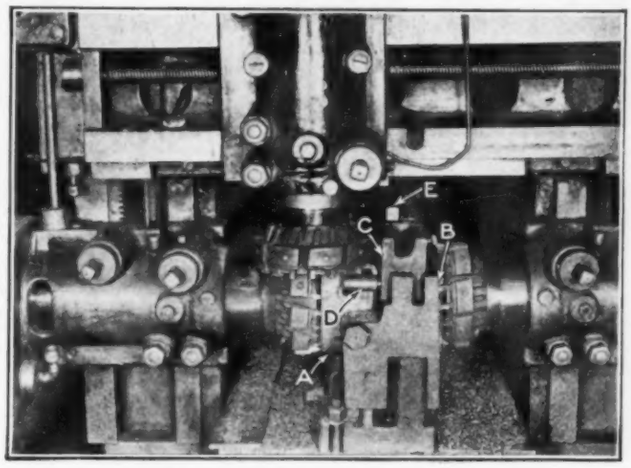


FIG. 2. THE FIRST MILLING OPERATION

A general view of this operation, together with the conveying methods, is shown in Fig. 3. Every effort is made to reduce manual labor by providing conveyors and hoists where they can be satisfactorily used. The conveyor at the extreme right allows the cylinder to be easily handled between departments.

The flange bolt holes are then drilled and two of them used for locating future operations, after which the cylinders are bored vertically. From this operation they come down the slide *A* at the extreme right of Fig. 4 and are loaded, nine to the truck, for annealing to remove internal strains. The trucks are pushed into the annealing ovens which are on a level with the floor in front of them and remain for about 45 min. at a temperature of approximately 500 deg. F.

Next comes the grinding of the cylinder bottom on a Pratt & Whitney machine, as in Fig. 5, this being followed by the second boring on the Foote-Burt machine

FIG. 3. CYLINDER MILLING DEPARTMENT

FIG. 4. ANNEALING THE CYLINDERS

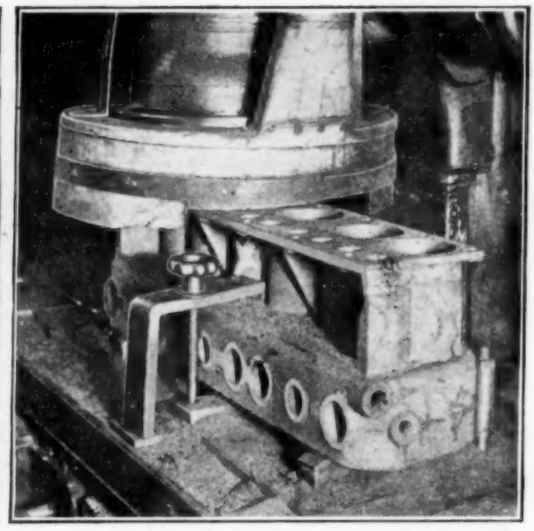


FIG. 5. GRINDING THE BOTTOM

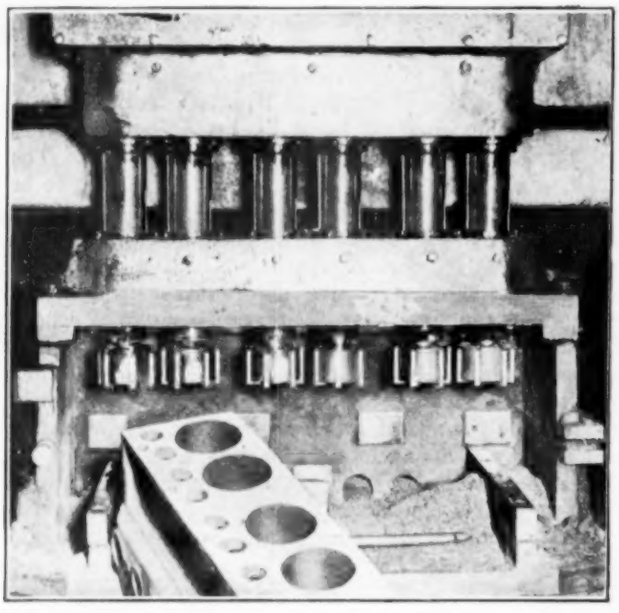


FIG. 6. THE SECOND BORING OPERATION

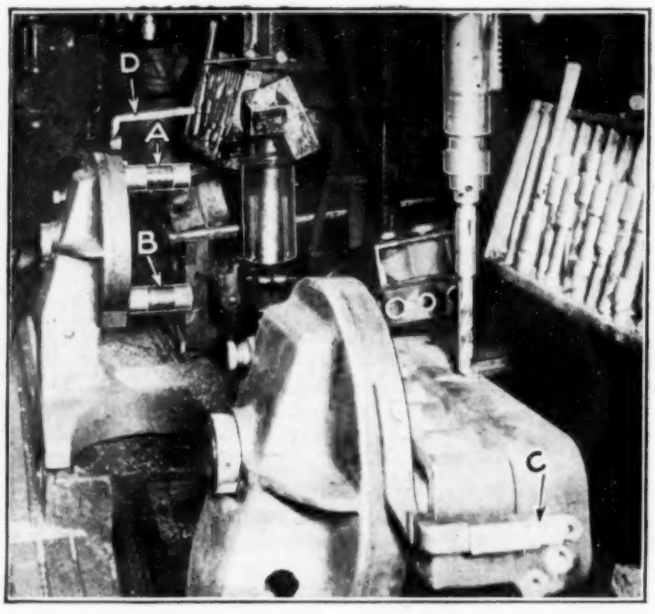


FIG. 7. DRILLING WATER-JACKET PLUGS

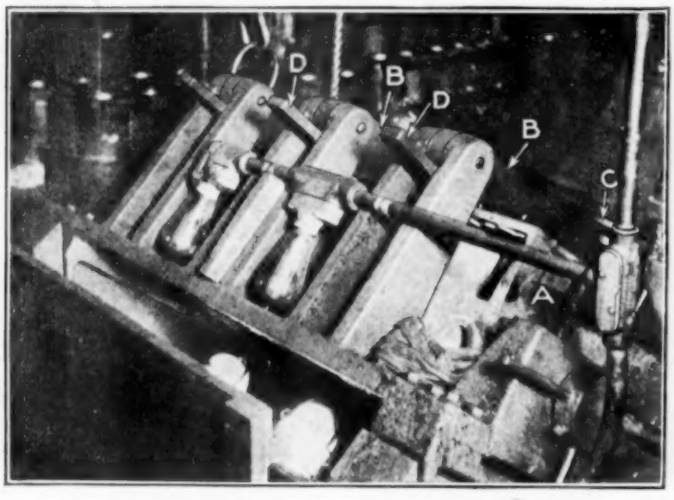


FIG. 8. THE WATER TEST

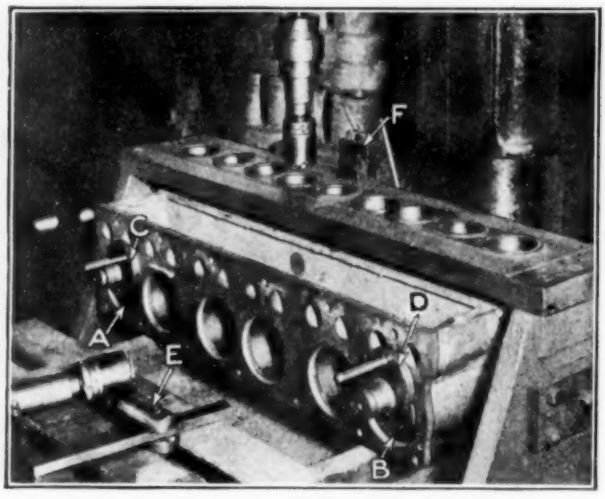


FIG. 9. COUNTER BORING INLET

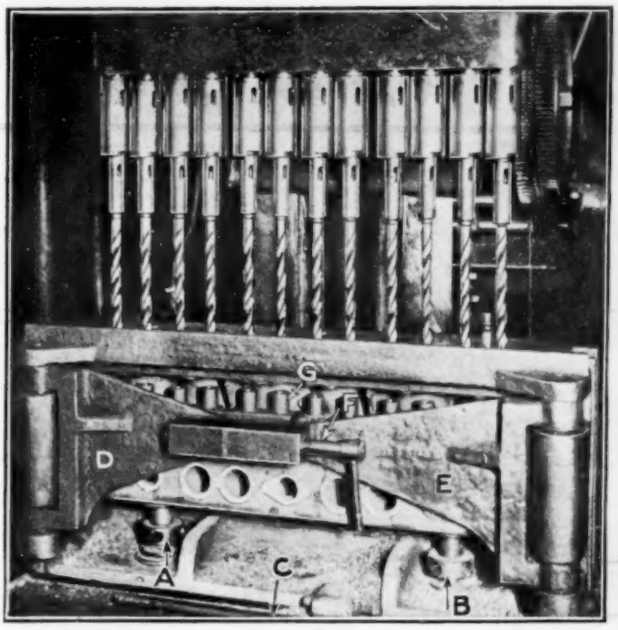


FIG. 10. DRILLING VALVE-GUIDE HOLES

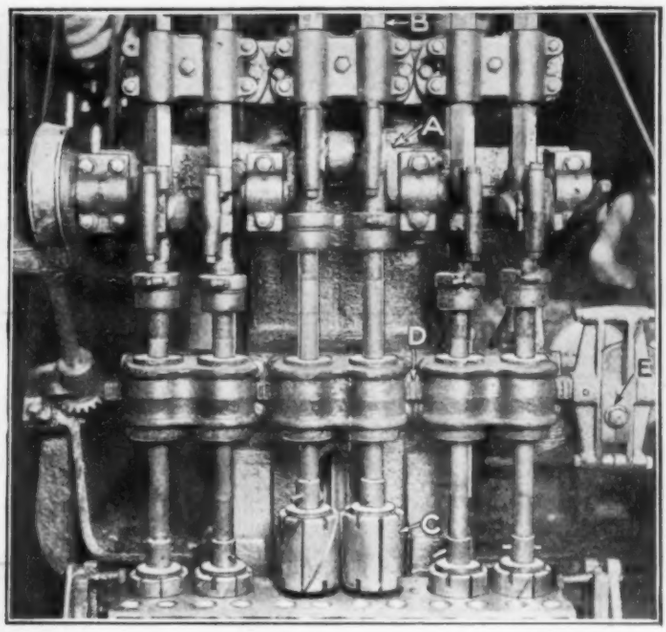


FIG. 11. LAPPING THE CYLINDER BORE

in Fig. 6. This illustration shows the usual type of fixture with the cylinder block resting on parallel bottom strips and held in position in the usual manner.

The water-jacket plug holes are next drilled and reamed on the fixture shown in Fig. 7. These fixtures have two studs or horns, *A* and *B*, which enter the second and fifth cylinder bores and so locate the cylinder blocks. This is an indexing fixture so that the block can be swung through a complete circle, bringing the arm *C* into the position *D* for drilling the end hole. The convenient rack for holding the drilling tools should also be noticed.

The Water Test

Next comes the water test in the fixture shown in Fig. 8, the operator standing on the opposite side. A small hoist is provided for those who desire it and the cylinder block placed in position as at *A*. The arms *B* are screwed down into place by means of handwheels, of which the rim of one can be seen at *C*, that act as nuts. The projections *D* are for holding the levers in an upright position when released, so as to be easily reached by the operator. Electric lights are provided so as to make inspection easy at all points. Should any leaks develop all necessary repairs can be satisfactorily made and the water test again applied.

The lower ends of the cylinder bores are then chamfered, the cylinder head bolt holes drilled and the inlet and exhaust ports counterbored. The latter operation is done in the fixture shown in Fig. 9, which is somewhat out of the ordinary. This fixture has two horizontal posts or studs, *A* and *B*, each carrying an eccentric cap as shown at *C* and *D*. When the caps are swung down they become concentric with the post so that the cylinder bore can be easily slid over them. After the cylinder block has been located they are turned up into the position shown and hold the cylinder block in place during the counterboring operation. The block is located endwise from the central hole by means of the plug *E*, with its swinging bar which fits into the slot in the block *F*. One of the counterboring tools is shown beside the locating plug.

The valve-guide holes are drilled in the fixture shown in Fig. 10. The cylinder is held with its face flange against the underside of the drill bushing, being forced in place by means of jackscrews *A* and *B*. These screws are readily set up by means of the bar *C*.

The swinging arms *D* and *E* are then closed in front of the cylinder block as shown and locked in position by means of the bar *F* which goes through both arms. The arms carry the bushings *G*, which guide the drills close to their work in the L-head of the cylinder block.

Then the valve-guide holes are reamed, the clearance holes bored and the valve seats beveled. Guide bosses are then faced and manifold stud holes drilled.

Lapping the Cylinders

The finishing of the cylinder bore comes next, this being done by lapping instead of grinding, reaming or rolling. Fig. 11 is a close view of the lapping machine showing the details. The three-throw crankshaft *A* imparts vertical motion to the laps, the upper ends being

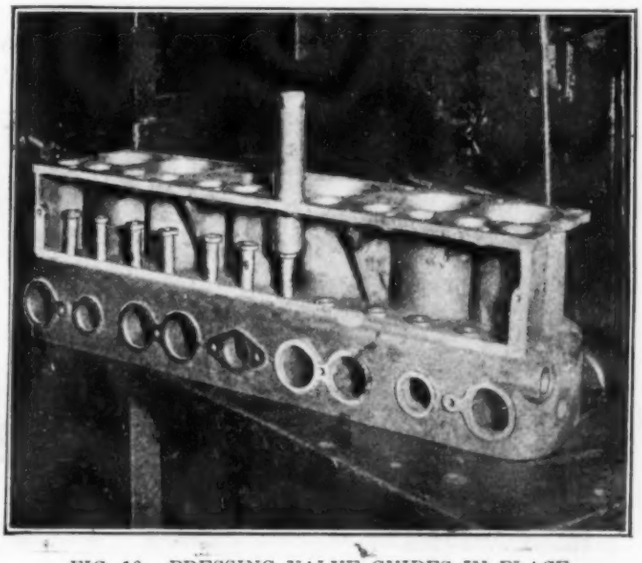


FIG. 12. PRESSING VALVE GUIDES IN PLACE

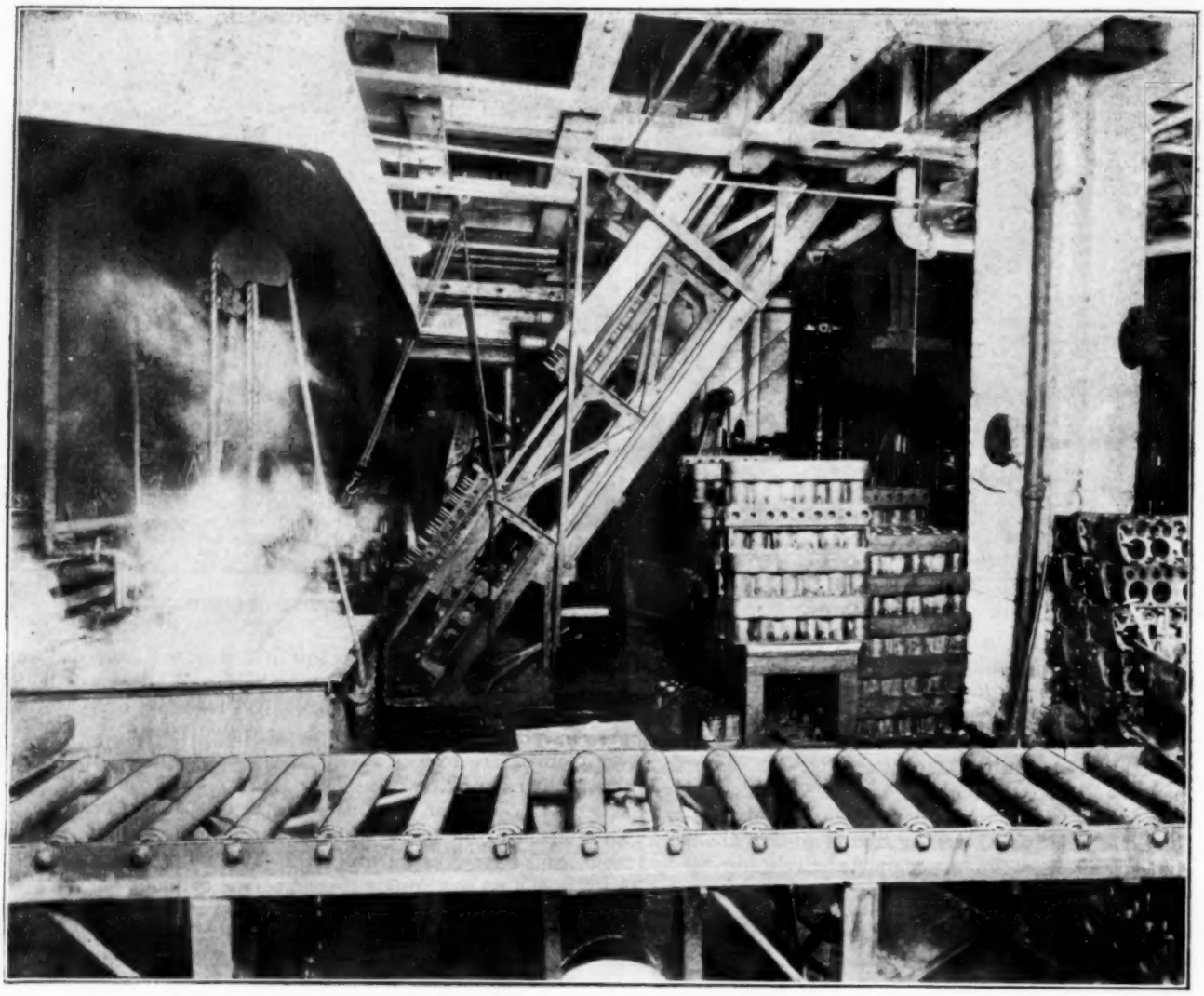


FIG. 13. CONVEYING CYLINDERS TO SECOND FLOOR

guided by the square bars *B*. The crankshaft works in Scotch yokes so as to avoid the angularity incident to the use of connecting rods. The rods driving the laps *C* are free to rotate, each carrying a pinion which meshes into the rack *D* that engages pinions on all six spindles. Motion is imparted to this rack by the crank *E*, also working in a Scotch yoke, the two movements giving a turning and reciprocating motion at the same time.

The laps themselves are of cast iron and made in four parts. They are prevented from turning by pins which engage the slots at each end of the section and are expanded by light springs so as to insure proper contact with the cylinder walls. A very fine abrasive is used, and this of course is carefully washed out after the lapping operation has been completed.

After this all the top holes are drilled and the top

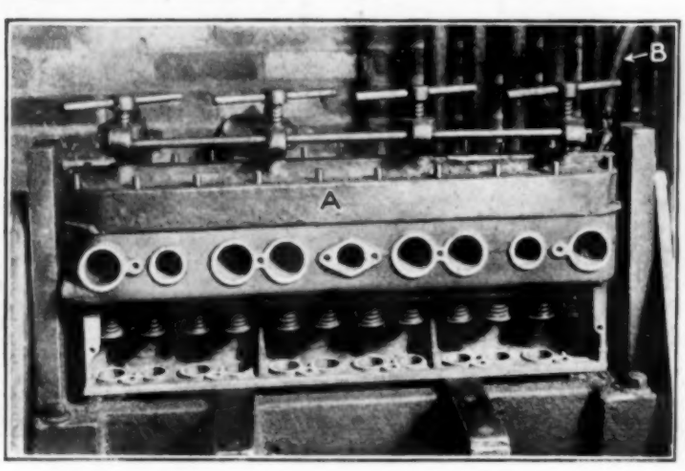


FIG. 14. TESTING THE VALVES

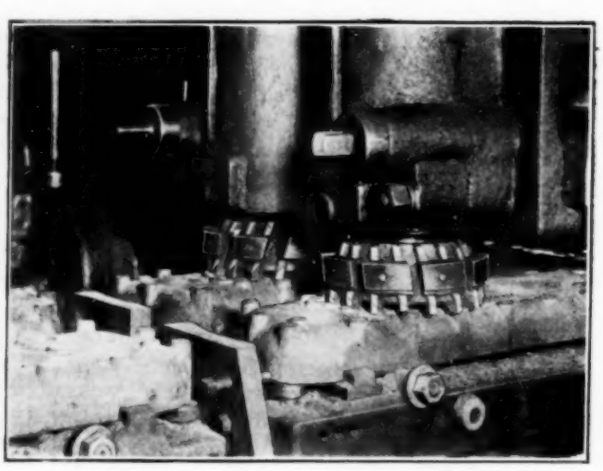


FIG. 15. MILLING CYLINDER HEADS

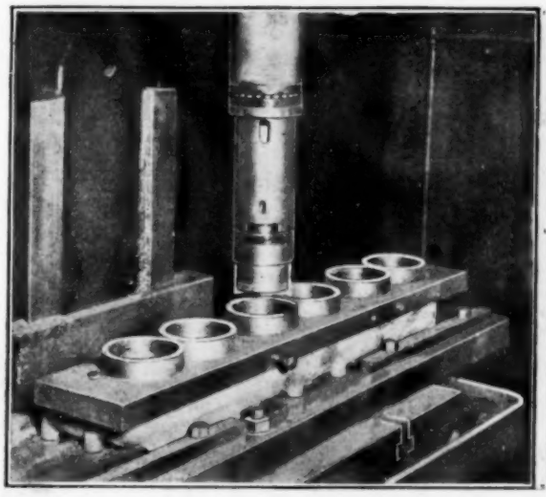


FIG. 16. MACHINING THE CYLINDER DOME

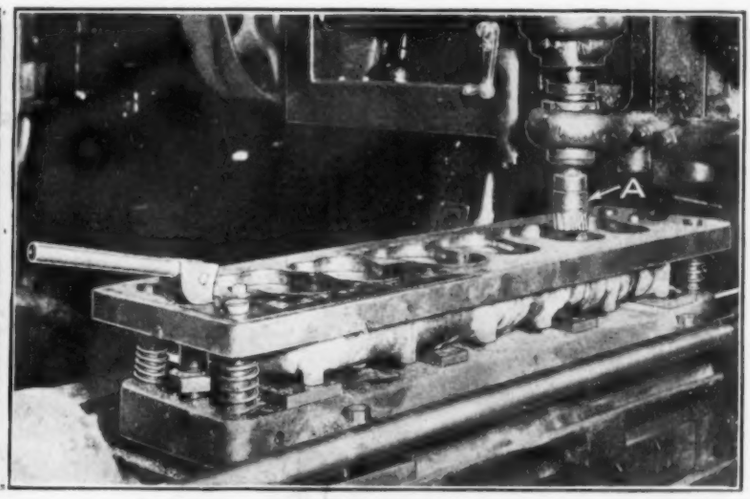


FIG. 17. PROFILING THE CYLINDER HEAD

surface ground in the same way as the bottom flange. The top of the bore is then chamfered, and all holes tapped, both in the top and for the manifold. Then the block is thoroughly washed and is ready for pressing in the valve guides. This is done in a power driven arbor press, as shown in Fig. 12. The valve-plunger guide hole makes it easy to position the plunger used in forcing the guides into position.

The Assembly Department

The valve-stem guides are then reamed and the studs for holding the cylinder heads are screwed into place. The congested condition of the plant makes it necessary to economize space in every way and the assembling department is on the floor above. After thoroughly cleaning the cylinder blocks in a hot solution they are placed on the conveyor and carried up to the assembling department, as in Fig. 13. Here the valve seats are hand reamed, the valves put in place and ground and after being carefully inspected, cleaned, and assembled, the valves are air-tested, as shown in Fig. 14. A special head shown at *A* is firmly clamped on the cylinder block by means of the four screws shown. Air pressure is then admitted from the air line at *B* and leaks are readily detected. The cylinder head is tested in the same way, after which the head is put in place on the cylinder and the edges ground flush, cleaned and sprayed with two coats of enamel.

The Cylinder Head

Going back to the manufacture of the cylinder head itself, the first operation is to drill the spark plug holes, after which the top and bottom are milled. The first milling operation is shown in Fig. 15, which gives an idea of the sort of fixture used and the amount of metal removed by the cutters.

All the remaining holes are then drilled and tapped, after which the cylinder head is finished on the inside on a Baker drill, as shown in Fig. 16. The demands for more uniformity in cylinder compression and greater fuel economy have led to the finishing of the compression space and this operation is typical of the newer methods which are being introduced into the manufacture of motors for medium-size cars. The cutting tool is guided by the substantial bushing shown and after this operation the head is profiled for the valve clearance and a finishing cut taken in the profiling machine.

Next comes the profiling of the cylinder head, as shown in Fig. 17. This view also shows the construction of the holding fixture, which uses the guide for the profiling cutter as part of the holding-down plate. This fixture is quick acting, as when the clamping levers are thrown in a vertical position the upper plate can be lifted entirely free if desired. The springs on the corner posts raise the plates out of contact and allow the work to be readily changed. The guiding surfaces for the roller *A* are sectional and fastened in the plate so as to be easily renewable. It will also be noticed that the whole plate is surrounded by a steel band to add to its strength.

Finishing

After profiling, the bottom or joint surface is ground the same as the cylinders, the spark plug holes are reamed and tapped and the head water-tested. It is then ready to join the cylinder on its way to the motor assembling department.

The Essex Cylinder

In adding the methods of machining the Essex cylinder it has been necessary to omit the majority of the operations which are more common and to illustrate only a few which are a little out of the ordinary.

The bottom flange of the cylinder block is first milled to provide a surface for future location as shown in Fig. 1. The cylinder blocks are strung on the long bed

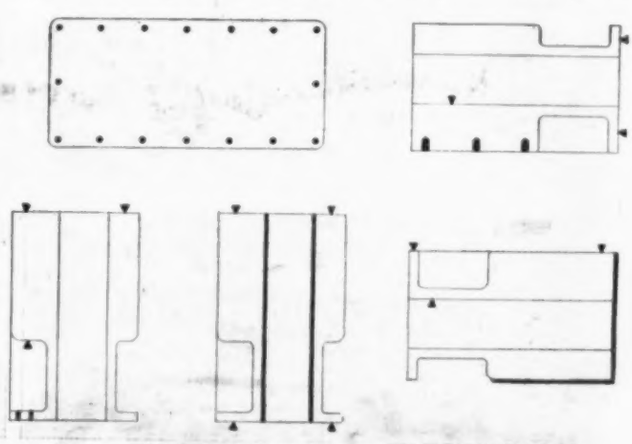


FIG. 1. TRANSFORMATION OF ESSEX CYLINDERS

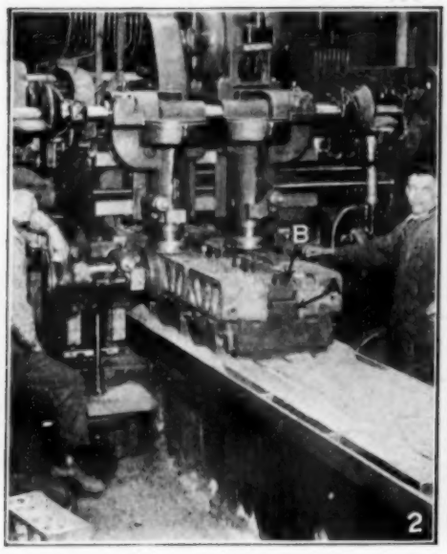


FIG. 2. DOUBLE CYLINDER FIXTURE

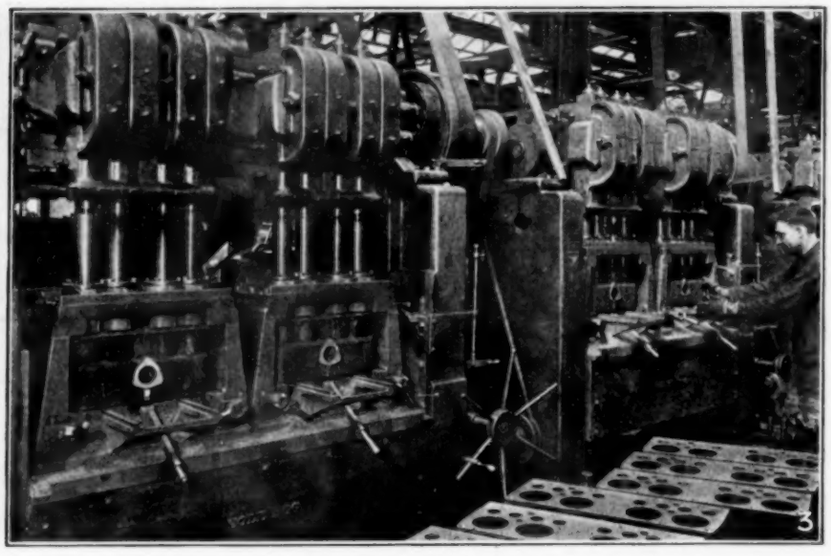


FIG. 3. BORING THE CYLINDERS

of the planer-type milling machine shown in Fig. 2. As will be seen, the fixture carries a double row of cylinder blocks, each with its bottom flange butted against a raised central portion *A*, of the fixture and squaring the other operations with the base flange.

The fixture is easily loaded and after the cylinders are in position, the clamps *B* hold them firmly in place by the insides of the cored holes. The combination of a comparatively light-weight cylinder block, together with the design of the fixture which enables the castings to be easily and quickly strapped in place, insures good production with little idle time of the machine.

The cylinder holes are bored on "hole hog" boring machines, as shown in Fig. 3 The fixtures are of the usual type, but the double machines shown are somewhat out of the ordinary.

Drilling and Reaming

The drilling and reaming operations shown in Fig. 4 involve the use of interesting and easily handled fixtures. The drilling and reaming of the valve plunger holes on the machine at the left employ individual fixtures, on which the cylinder blocks are fastened by means of the single clamps *A*, the fixtures being slid onto the raised ways *B*, in which position the work under the drills and reamers is done. Suitable stops are also provided as at *C*, all tending to save time and secure maximum production from the machine itself.

This view also shows another operation, the drilling of the holes for the manifold studs and similar openings on the side of the cylinder. The fixture for this is shown at *D*, mounted on the table of a Baush multiple spindle drilling machine. Thi. fixtur. has two studs or mandrels, which not only center, but support the cylinder block by entering the end cylinder bore. These studs have been flattened on four sides, leaving a suitable guiding surface, but eliminating friction and the possibility of scratching the cylinder bore, by means of chips caught in the hole.

Multiple-Spindle Drilling Machines

In Fig. 5 is shown a group of multiple spindle drilling machines, working on the cylinder heads. These machines are arranged with special tables which are connected so that the drilling fixtures are easily moved from one machine to the next, and after the last operation has been performed, and the work removed, the empty fixture is placed on the roller conveyor conveniently placed directly behind the men, so that it can be returned to the starting point without difficulty.

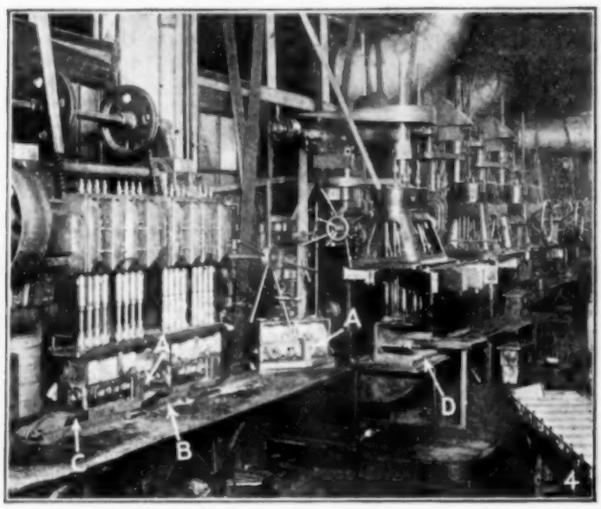


FIG. 4. TWO DRILLING OPERATIONS

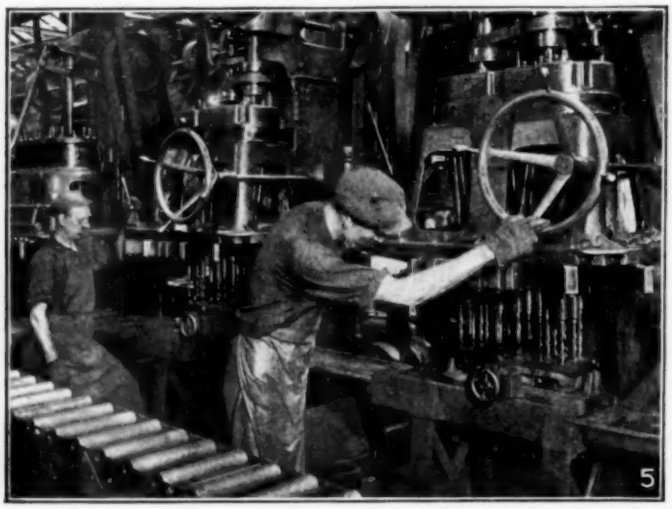


FIG. 5. DRILLING THE HEADS

Steel Compression Springs of Circular Cross Section

By T. F. STACY

THE accompanying set of charts was developed by the writer in connection with his work for the Hydraulic Press Manufacturing Co. They have been used for the design of compression springs varying in size from those used on the checks of small valves to those for pull-back springs on large hydraulic presses and for shock absorbers on large weighted accumulators.

The computations are based on the usual formulas for cylindrical compression springs of circular cross section, the derivation of which may be found in any reference book on springs. The usual form in which these appear is as follows:

$$W = \frac{\pi d^3 S}{8D} \qquad f = \frac{8WD^3}{d^4 G}$$

in which

W = force acting along axis,
D = pitch diameter of coil—center to center of wire,
d = diameter of wire,
S = maximum fiber stress (in torsion) in pounds per square inch.
G = modulus of torsion,
f = deflection of spring per acting coil.

Since it is desirable to know the outside rather than the mean or pitch diameter or the spring, $O.D. - d$ was substituted for D in the above formula. These were combined and reduced by substituting suitable values of G and S to get them into suitable form for making computations.

The values of S vary in the different charts according to the size of wire used. These allowable stresses are based on the recommendations of the Raymond Spring Co., of Corry, Pa., and are somewhat higher than those given in the older reference books on the subject. The charts are for round steel wire.

For brass or phosphor-bronze wire the allowable force W acting along the axis of the spring is 0.60 times and the deflection per coil is 0.84 times that given in the chart for a steel wire spring of the same outside diameter and same size of wire. These figures are based on a maximum fiber stress of 60,000 lb. per square inch and a modulus of torsion of 8,000,000 for brass or phosphor bronze.

Springs made of square wire have an allowable force W equal to 1.2 times that of a spring made of round wire, but for the same fiber stress have an allowable deflection per coil equal to 0.707 that for round wire. It can be shown that a spring made of square wire will be 50 per cent heavier than the same spring (i.e. of the same maximum load and same deflection) of round wire.

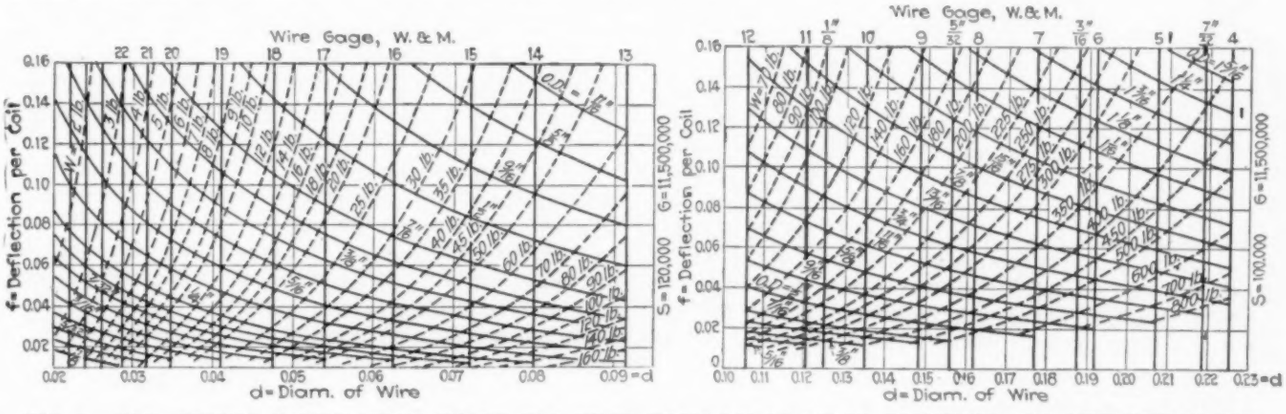


FIG. 1. COIL SPRING CALCULATION CHART FOR WIRE FROM 0.02 TO 0.23 IN. DIAMETER AND DEFLECTION PER COIL FROM 0.02 to 0.16 INCHES

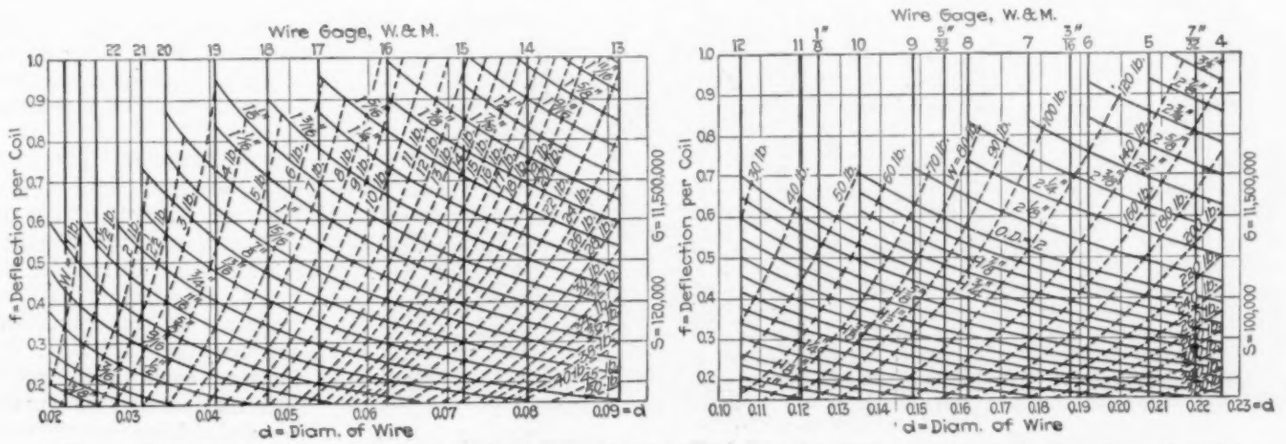


FIG. 2. COIL SPRING CALCULATION CHART FOR WIRE FROM 0.02 TO 0.23 IN. DIAMETER AND DEFLECTION PER COIL FROM 0.2 TO 1.0 INCHES

The charts take the form of so-called contour charts, made use of where four variables are to be considered. The variables here are maximum load, outside diameter, diameter of wire and allowable deflection per coil. The diameter of wire is plotted along the axis of ordinates, and to aid in choosing wires of standard size vertical lines are ruled heavy and numbered along the top of each chart according to the Washburn and Moen gage which is the standard for spring wires. This gage is the same as the American steel wire gage and the Bureau of Standards has recommended the name "U. S. Steel Wire Gage" or merely "Steel Wire Gage." The charts possess the advantage over tables of being more compact and of showing to the eye how a change of one variable will affect the design. This is most valuable since first computations are seldom final One problem will be worked out as an illustration.

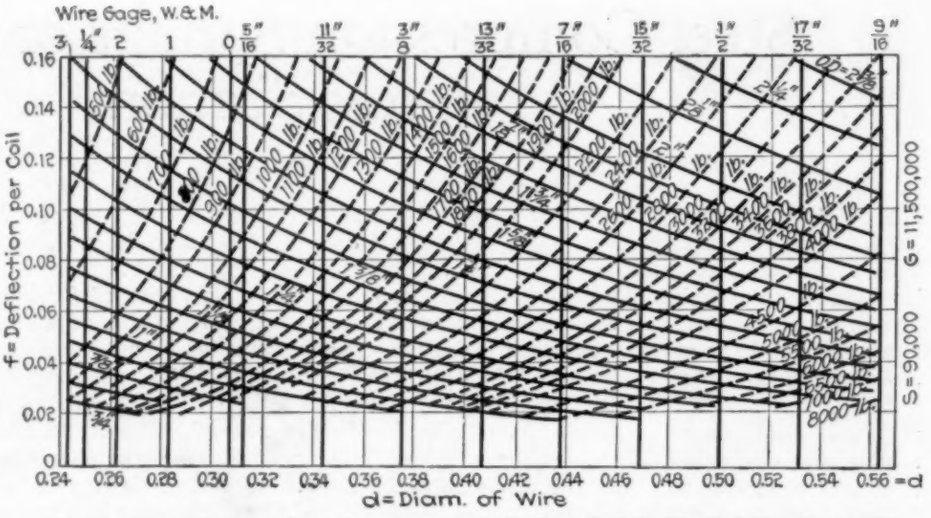


FIG. 3. COIL SPRING CALCULATION CHART FOR WIRE FROM 0.24 TO 0.56 IN. DIAMETER AND REFLECTION PER COIL FROM 0.02 TO 0.16 INCHES

We will assume it necessary to design a spring to fit inside a 3½ in. standard pipe. It is to carry at all times a minimum compression of 300 lb. and it shall be deflected 4 in. from this point under a maximum load of 450 lb. Since 150 lb. increase over the initial loading deflects the spring 4 in. the initial load of 300 lb. will deflect the free spring 8 in. This is true according to Hook's law and up to the elastic limit of the material. The total deflection of the spring is therefore 12 in. To fit inside a 3½ in. pipe we will choose a spring of 3¼ in outside diameter. On the charts we find at the intersection of the curves for 3¼ in. *O.D.* and 450 lb., a diameter of wire of 0.334 in. We will take the next largest wire of standard size which is ⅜ in. diameter. For an *O.D.* of 3¼ in. this gives an allowable deflection per coil of 0.61 in. and a maximum load of 495 lb. The spring is safe since the working load is under the maximum given for the allowable fiber stress. With a total deflection of 12 in. and an allowable deflection per coil of 0.61 in. we need 12/0.61 = 20 acting coils. If the ends are to be squared and ground we will allow two extra coils. The solid height of the spring will be $22 \times \frac{11}{16} = 7\frac{7}{8}$ in. The free length of the spring will be $7\frac{7}{8} + 12 = 19\frac{7}{8}$ in. Its length at the point of initial or minimum compression will be $11\frac{7}{8}$ in.

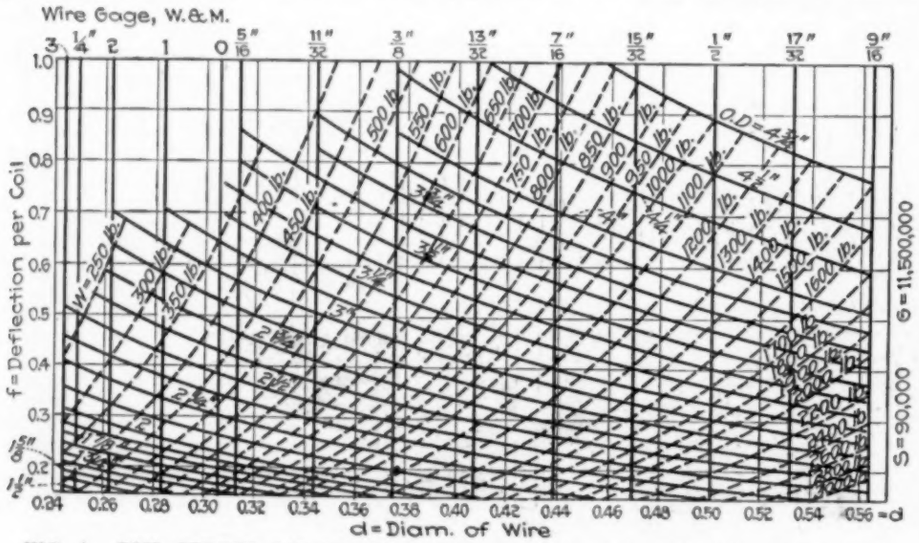


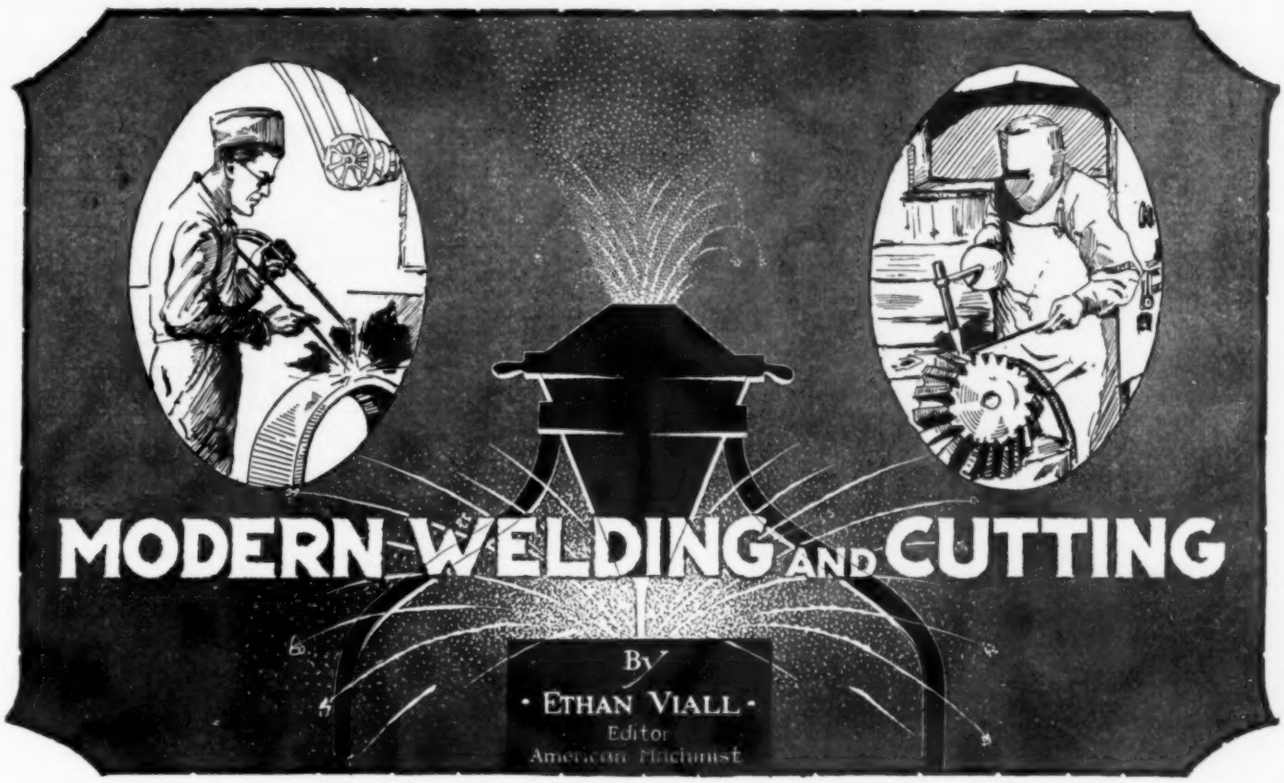
FIG. 4. COIL SPRING CALCULATION CHART FOR WIRE FROM 0.24 TO 0.56 IN DIAMETER AND REFLECTION PER COIL FROM 0.2 TO 1.0 INCHES

Senator Davenport in the Machine Shop

BY G. F. OLIVER

We read with interest [page 340, *American Machinist*] that Senator Frederick M. Davenport, from the Thirty-Sixth (Oneida) district of the State of New York, is spending his vacation in the plant of the Franklin Automobile Co. at Syracuse, N. Y., his object being to study and get at first hand the industrial relations between employer and employee. While his action in donning the overalls indicates an honest desire to obtain this information, we venture to predict, that because he is known as Senator Davenport, his point of view of conditions will not be the same as that of the wage earner. Naturally great courtesy will be shown him by the management and respect and consideration by the men, and to both he will always be Senator Davenport. He may be able to find the inner workings of the lathe, but he will never get to the inner workings of the minds of men, because not being one of them, he can but study them from the outside.

The Senator's effort is praise-worthy, and a step in the right direction, but he should have gone further, until he had arrived at the real standpoint of the worker (not that conditions are anything but good). The Senator could have gotten information had he applied for and obtained employment with identity unknown.



IN SHOWING examples of different makes and types of arc welding sets, only enough will be selected to cover the field in a general way, and no attempt whatever will be made to make the list complete.

The General Electric Co., Schenectady, N. Y., puts out the constant energy metallic electrode set shown in Fig. 322. This, however, is but one type of its machines as this company makes a varied line covering all needs for welding work.

This particular machine combines high arc efficiency and light weight. The balancer set is of the well-known G-E standard "MCC" construction. It is built for operation on 125-v., d.-c. supply circuits, which may be grounded on the positive side only, and is rated "MCC" 3 kw., 1,700 revolution, 125/60/20 v., compound-wound, 150 amperes, RC-27-A frames, the two armatures being mounted on one shaft and connected in series across the 125-v. supply circuit, one welding circuit terminal being taken from the connection between the two armatures and the other from the positive line. By this means each machine supplies part of the welding current and, consequently, its size and weight is minimized. The design of the fields and their connections is such that the set delivers the voltage required directly to the arc without the use of resistors or other energy-consuming devices. The bearings are waste packed: this type of bearing being desirable in a set which is to be made portable either for handling by a crane or for mounting on a truck.

XXVII. Different Makes of Arc Welding Sets*

This is a continuation of the subject discussed in last week's issue. In this installment a number of well-known makes of arc welding sets are described.

(Part XXVI was published in last week's issue.)

The welding control panel for the balancer set is shown in Fig. 323. This panel consists of a slate base, 24-in. square, which is mounted on 24-in. pipe supports for portable work and on 64-in. pipe supports for stationary work.

The entire set consists of one ammeter, one voltmeter, one dial switch, two field rheostats (motor and generator) one starting equipment with fuse, one reactor mounted on the pipe frame work of panel. The ammeter and voltmeter are enclosed in a common case. The ammeter indicates current in the welding cir-

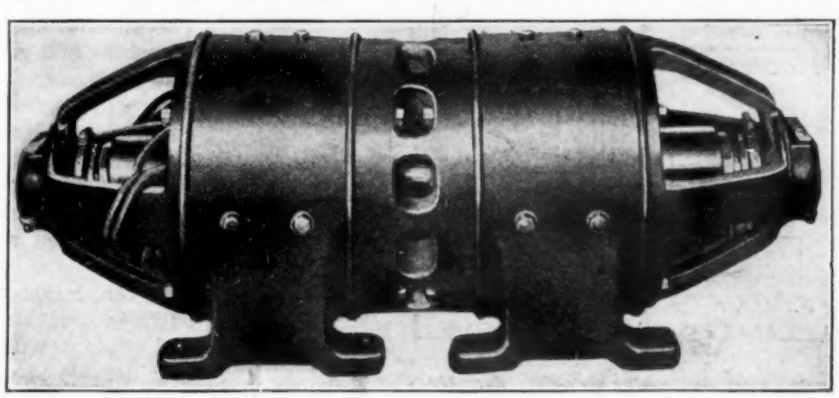


FIG. 322. GENERAL ELECTRIC 3-KW., 1,700-R.P.M., 125-60-20-V. COMPOUND-WOUND BALANCER-TYPE ARC WELDING SET

*For the author's forthcoming book, Welding and Cutting.

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cuit and the voltmeter is so connected that by means of a double-throw switch, either the supply line voltage or the welding line voltage can be read.

The dial switch is connected to taps in the series field

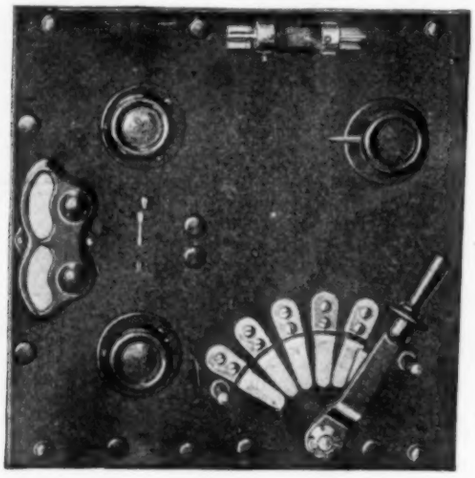


FIG. 323. WELDING CONTROL PANEL FOR BALANCER SET

of the generator, the field being connected to oppose the main field. This feature provides the current control by which six steps are obtained of the approximate values 50, 70, 90, 110, 130 and 150 amp., which enables the operator to cover a very wide range. In addition, if intermediate current values are required, they can be obtained by means of the generator field rheostat.

A small reactor is used to steady the arc and current both on starting and during the period of welding.

Arc welding is usually done on metal which is grounded and this is especially unavoidable in ship work, where the ship structure is always well grounded.

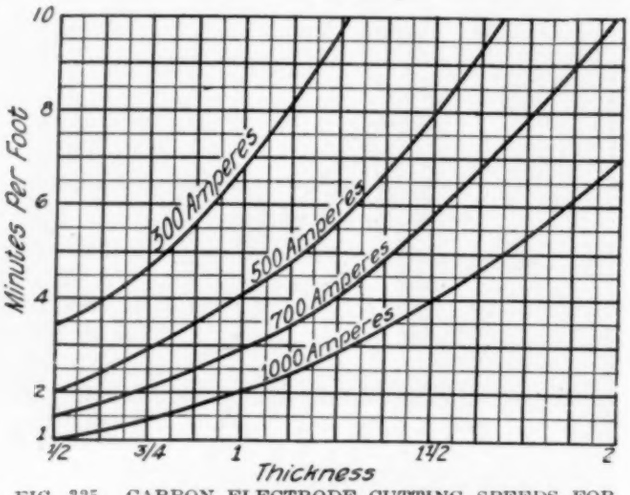


FIG. 325. CARBON ELECTRODE CUTTING SPEEDS FOR DIFFERENT THICKNESSES OF PLATE

Since successful operation requires that the positive terminal be connected to the work the supply circuit should be safely grounded on the positive side.

Where a 125-v., d.c. supply system is not available, standard "MIC" or "MCC" sets are furnished to supply power at 125 v., the motor being either 3-phase, 60-cycle, 220, 440 or 550 v., or d.c., 230 or 550 v., and in three capacities, 5½ kw., 7 kw., and 15 kw. With each motor generator set there is supplied a panel containing generator field rheostat and motor starter, which may be mounted beside the balancer panel. A diagram showing the balancer and control panel is shown in Fig. 324.

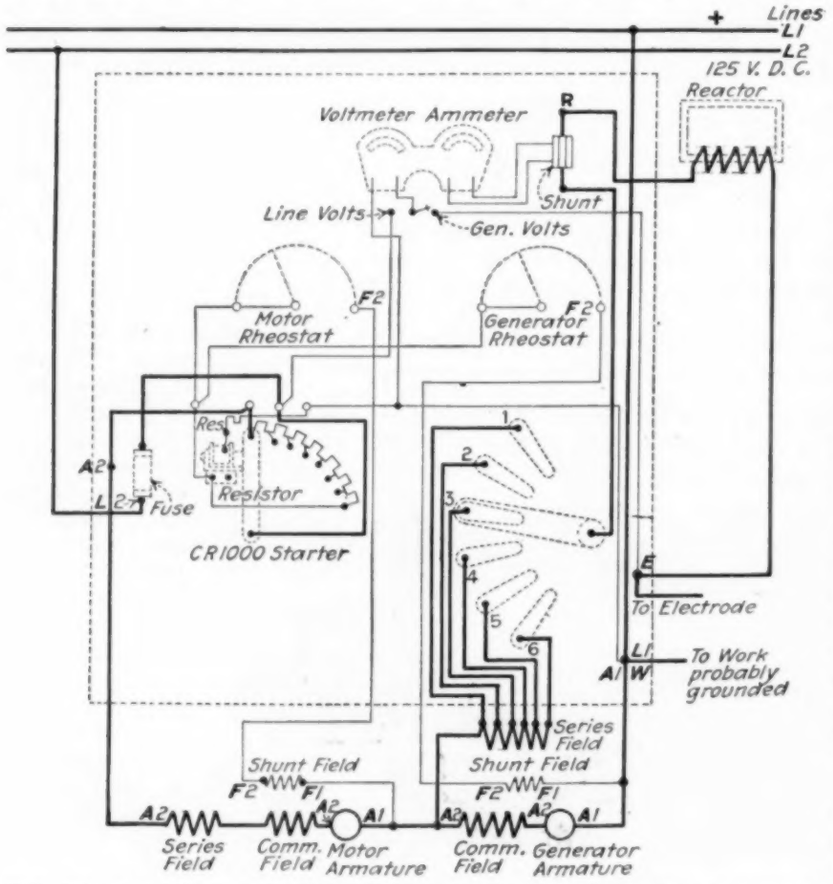


FIG. 324. BALANCER AND CONTROL PANEL CONNECTIONS FOR GENERAL ELECTRIC CONSTANT-ENERGY CONSTANT-ARC SET

The constant energy arc-welding equipment supplies, to the arc, practically constant energy throughout the welding range for metallic electrode welding only. If the arc is lengthened slightly the voltage increases and the current decreases, the total energy being practically constant. As the voltage required by the arc varies, the generator readjusts itself to this condition and automatically supplies the required voltage; the remainder being utilized by the motor end of the set. The interchange of voltage between the motor and generator is practically instantaneous, no perceptible lag occurs. This feature is valuable when metal drops from the electrode and causes an instantaneous increase in current. The commutation is sparkless and the welding circuit may be short-circuited without injury to the machine.

In connection with welding with an outfit of this kind, the practical man and student will find Table XXV of considerable interest. For sheet steel cutting using the carbon arc, the chart Fig. 325 is given.

BUTT WELDS BY METALLIC ELECTRODE—LAP WELDS WILL BE APPROXIMATELY THE SAME AS TWO BUTT WELDS—POWER 3c PER KW-HR:—LABOR 30c PER HR. ELECTRODE 5c PER LB.

Thickness of Metal	Diameter Electrode	Speed Ft. per Hr.	Amperes	Mean Kw. at 60 Volts	Mean Kw. at 70 Per Cent Eff.	Approx. Electrode per Hr Lb.	Power per Hour ¢	Labor ¢	Electrode ¢	Total per Hr ¢	Total per Ft. ¢
1/8	1/8	20	High 50 Mean 40 Low 30	1.8	2.0	0.9	6.0	30	4.5	40.5	2.0
1/4	1/8	16	90 70 50	1.4	3.6	1.4	10.8	30	7.0	47.8	3.0
1/4	1/8 or 1/4	10	125 100 70	2.0	5.1	3.1	15.3	30	15.5	60.8	6.1
3/8	1/4 or 1/4	6.5	150 125 100	2.5	6.4	3.6	19.2	30	18	67.2	10.3
1/2	1/4	4.3	150 140 120	2.8	7.2	3.8	21.6	30	19	70.5	16.4
5/8	1/4	2.8	150 125	3.0	7.7	3.4	23.1	30	17	70.1	25.4

NOTE.—The figures given for power labor and material are arbitrary and may be changed to suit local conditions.
• Based on power supplied.

TABLE XXV. DATA FOR METALLIC ELECTRODE ARC BUTT AND LAP WELDS

The Wilson "plastic arc" process and apparatus was first developed in railroad work by the Wilson Welder and Metals Co., New York, in order to enable the welder to control the heat used. By this system it is claimed that any number of operators can work from one large machine without one welder interfering in any way with the work of another. Each operator can have properly controlled heat and a steady arc at the point of application. This system was largely used in the repair of the damaged engines on the German ships which were seized by us. By regulating the heat it is claimed that any metal can be welded without preheating.

A two-arc set is shown in Fig. 326 and a close-up of a control panel in Fig. 327. A portable outfit is shown in Fig. 328.

This outfit consists essentially of a constant voltage generator driven by any constant-speed motor, all mounted on a common bedplate. The regulation of the welding current is maintained by means of a series carbon pile acting as a series resistance of varying quantity under the action of increasing or decreasing mechanical pressure. This pressure is produced by means of a series solenoid operating mechanically on a lever and spring system which varies the pressure on the carbon pile inversely as the current in the main circuit. This establishes a constant current balance at any predetermined adjustment between a maximum and minimum range designed for. This change in adjustment is controlled by the operator at the point of work by means of a small pilot motor which shifts the lever center of the pressure mechanism, thereby raising or lowering the operating current. This system maintains a constant predetermined current at the arc regardless of the arc length. The operation of the mechanism is positive and quick acting. A special series choke-coil is mounted on the control panel for use as a cutting resistance.

The portable arc-welding outfit illustrated in Fig. 329 is the product of the Lincoln Electric Co., Cleveland, Ohio. The outfit is intended for operation where electric current is not available and consists of a 150-amp. arc-welding generator direct connected to a Winton gasoline engine. An interesting feature of the machine is the method used to insure a steady arc and a constant and controllable heat. A compound-wound generator is used, the series windings of which are connected to oppose the shunt field, the two windings being so proportioned that the voltage increases in the same ratio that the current increases, thus limiting the short-circuit current. Another important effect of this is that the horsepower, and therefore the heat developed for a given setting of the regulator switch shown on the control board above the generator remains practically constant. It is claimed that this method of control gives considerably more work on a given amount of electricity than where the machines use the ballast resistance. Additional arc stability is insured by the stabilizer at the right of the illustration, this being a highly inductive low-resistance coil connected in the welding circuit and serving to correct momentary fluctuations of current.

WESTINGHOUSE SINGLE-OPERATOR ELECTRIC WELDING OUTFIT

The single-operator electric arc-welding equipment shown in Fig. 330 is manufactured by the Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pa. The generator operates at arc voltage and no resistance is used in circuit with the arc. The generator is designed to inherently stabilize the arc, thereby avoiding the use of relays, solenoid control-resistors, etc.

The generator has a rated capacity of 175 amp. and is provided with commutating poles and a long commutator, which enable it to carry the momentary over-

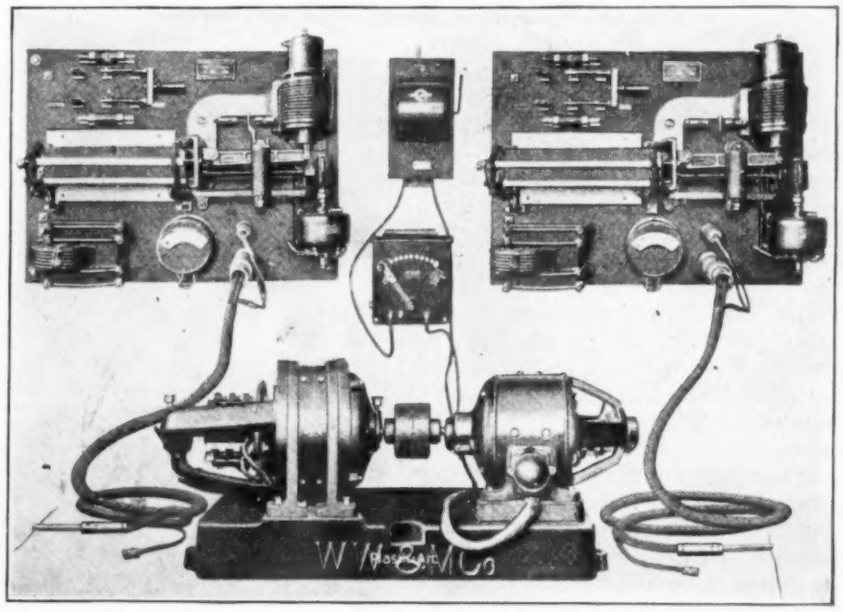


FIG. 326. WILSON TWO-ARC, 300 AMP., "PLASTIC ARC" WELDING SET

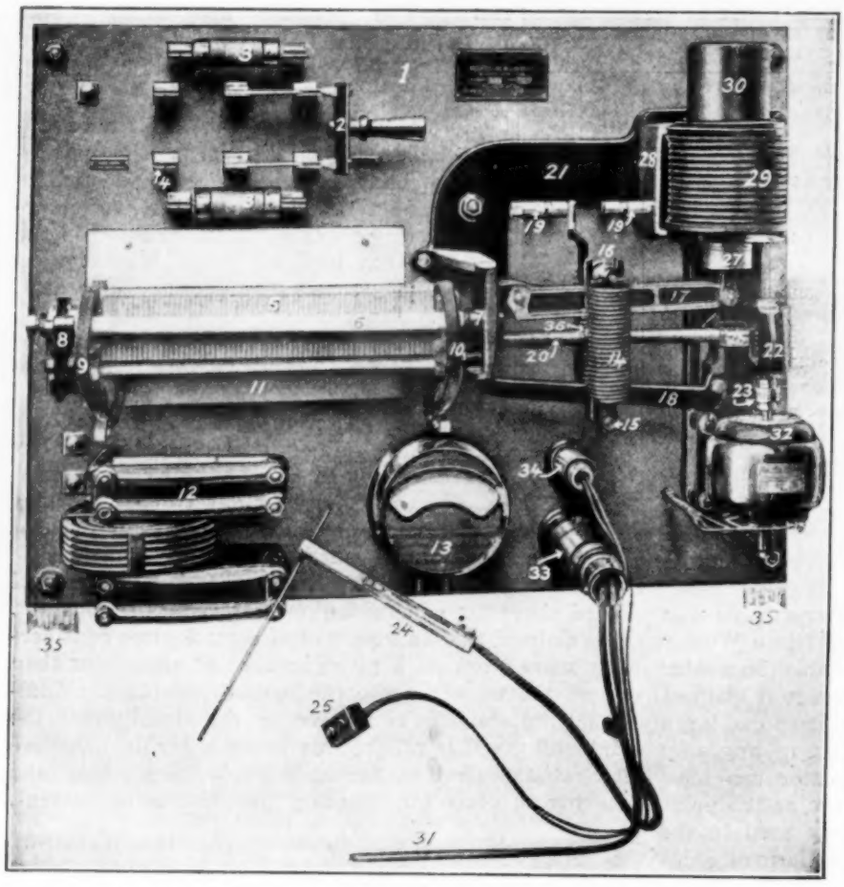


FIG. 327. WELDING AND CUTTING PANEL FOR WILSON SET

load at the instant of striking the arc without special overload protection.

Adjustment of Current Easily Made

Very close adjustment of current may be easily and quickly made, and, once made, the amount of current at the weld will remain fixed within close limits until changed by the operator. There are twenty-one steps provided which give a current regulation of less than 9 amp. per step and make it much easier for a welder to do vertical or overhead work.

The generator is mounted on a common shaft and bedplate with the motor. A pedestal bearing is supplied on the commutator end and carries a bracket for supporting the exciter which is coupled to the common shaft. Either d.c. or a.c. motors can be supplied. Where an a.c. motor is used leads are brought outside the motor frame for connecting either 220- or 440-v. circuits. An electrician can change these connections in a few minutes' time. This feature is desirable on portable outfits which may be moved from one shop to another having a supply circuit of different voltages. For portable service, the motor-generator set with the control panel is mounted on a fabricated steel truck, equipped with roller-bearing wheels. The generator is compound-wound, flat compounded, that is, it delivers 60 v. at no-load and also at full-load. The portable outfit, Fig. 331, is made by the U. S. Light and Heat Corp., Niagara Falls, N. Y. It is 28 in. wide, 55 in. high, 54 in. long, and will pass through the narrow aisle of a crowded machine shop. It weighs 1,530 lb. complete. In case a d.c. converter is used, the weight is about 125 lb. less. Curtains are provided to keep out dirt. A substantial cable reel is provided carrying two 50-ft. lengths of flexible cable for carrying the current to the arc. The reel is controlled by a spring which prevents the paying out of more cable than the welder needs. The outfit is made in several models to use 4 kw., 110-220-440-550 v., 2 and 3 phase, 25 and 60 cycle.

"Zeus" Arc-Welding Outfit

The "Zeus" arc-welding outfit shown in Fig. 332 is a product of the Gibb Instrument Co., 1644 Woodward Ave., Detroit, Mich. In this device the motor-generator customarily used has been supplanted by a transformer with no moving parts. The outfit is built on a unit system, which allows the installation of a small machine, and if the work becomes heavier a duplicate set may be connected in parallel. One of the features of the machine is the arrangement for regulation. It is not necessary to change any connection for this purpose, as a wheel connected with a secondary and placed on the top of the case raises and lowers this secondary, and provides the regulation of current necessary for different sizes of electrodes. The inherent reactance of the outfit automatically stabilizes the arc for different arc lengths.

The Arcwell Corporation, New York, has on the market an electric welding apparatus built for operation on alternating current of any specified voltage or frequency. It is shown in Fig. 333. It differs from the company's

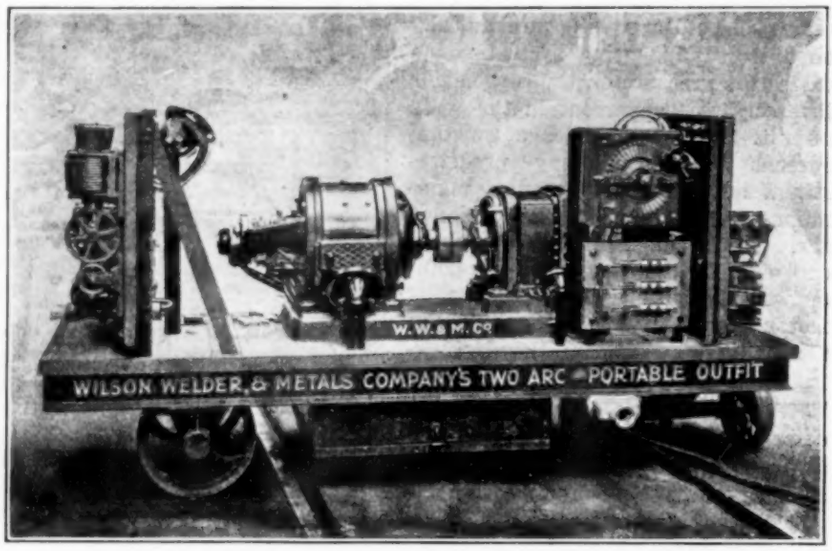


FIG. 328. PORTABLE SHOP-TYPE WILSON SET

standard outfit in that it is being put out expressly for the use of smaller machine shops and garages, its capacity not being sufficient to take care of heavy work on a basis of speed. It will do any work that can be done by the larger machines, but the work cannot be performed as rapidly, the machine being intended expressly for use by concerns who have only occasional welding jobs to perform. The machine weighs approximately 200 lb. and, being mounted on casters, it can be moved from one job to another.

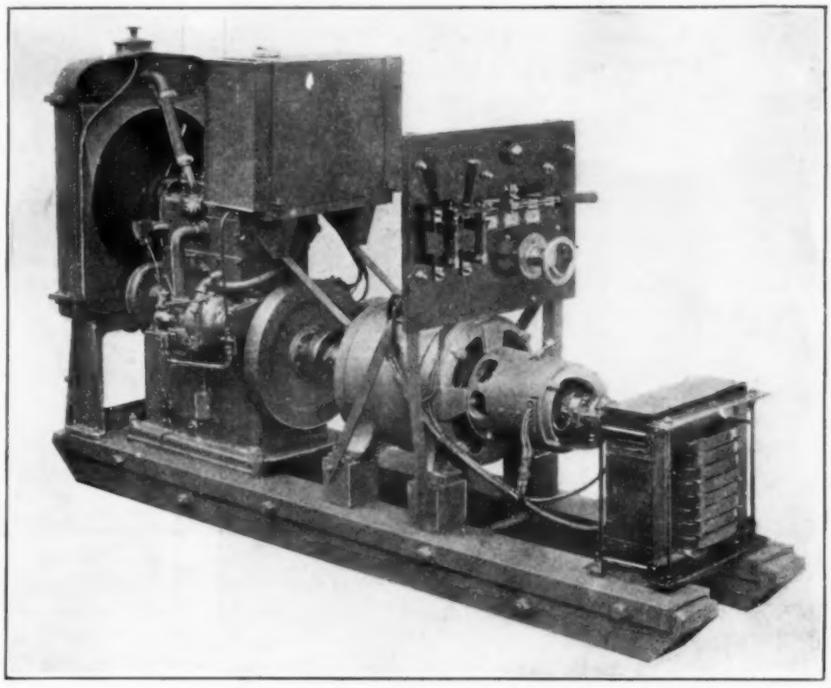


FIG. 329. LINCOLN SELF-CONTAINED PORTABLE SET

Alternating-Current Arc-Welding Apparatus

The Electric Arc Cutting and Welding Co., Newark, N. J., is now marketing the alternating-current arc-welding outfit shown in Fig. 334.

This illustration shows the entire apparatus for use on a single-phase circuit, the current being brought in through the wires seen protruding at the lower left corner.

The device consists principally of a transformer with no moving parts and is claimed to last indefinitely. In this apparatus, instead of holding either current or voltage constant as with direct-current sets, the wattage, or the product of voltage and current, is held constant. The alternating-current set holds the arc wattage without moving parts; hence the heat is substantially constant for any given setting, and it is claimed that as soon as any person becomes accustomed to the sound and sight of the arc and can deposit the molten metal where he desires it is impossible to burn the metal from too much heat or make cold-shut welds from too little heat. The amount of heat generated is controlled by means of an adjusting handle on the transformer together with taps arranged on a plugging board. It is stated that the kilowatt-hours required to deposit a pound of mild steel with this machine varies from 1½ to 2¼.

Their Largest Alternating-Current Set

Their largest a.c. set made is of the 60-cycle type and weighs about 200 lb., which places it in the portable class. The set can be furnished for any a.c. power supply, but it is not advisable to use a greater voltage than 650 on the primary. The set can also be made single phase, two phase three wire, two phase four wire, to operate across the outside wires of the two-phase system or from a three-phase power supply. Polyphase sets are about 30 per cent heavier than the single-phase sets. In the two-phase machine balanced current can be drawn from each of the two phases by placing the sets across the outside wires. This is advocated, as it provides for leading current on one phase which brings up the total power factor of the system and a

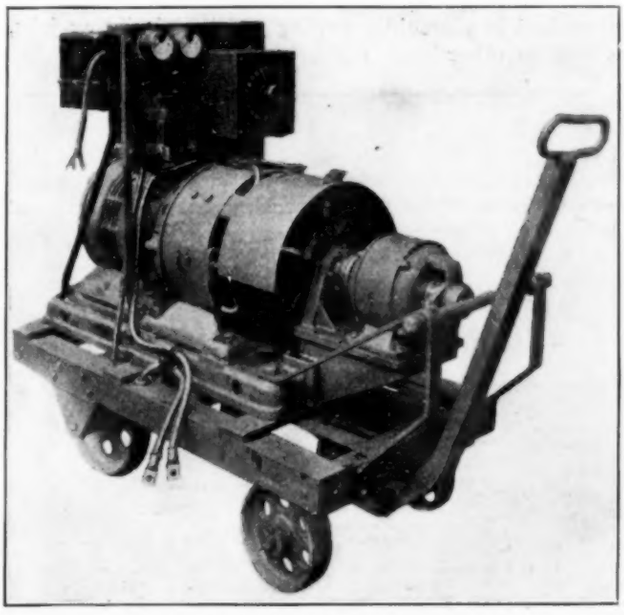


FIG. 330. WESTINGHOUSE SINGLE-OPERATOR PORTABLE OUTFIT

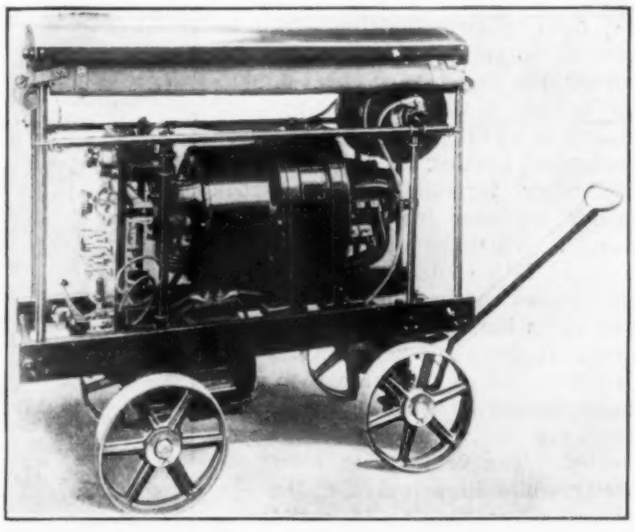


FIG. 331. U. S. L. PORTABLE, A.-C. MOTOR-GENERATOR SET

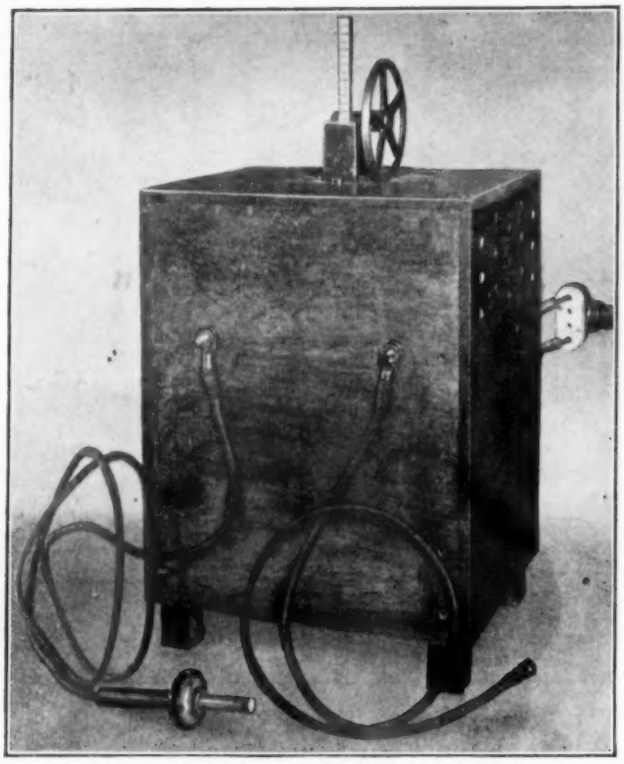


FIG. 332. ZEUS ARC-WELDING OUTFIT

FIG. 333. ARCWELL OUTFIT FOR ALTERNATING CURRENT

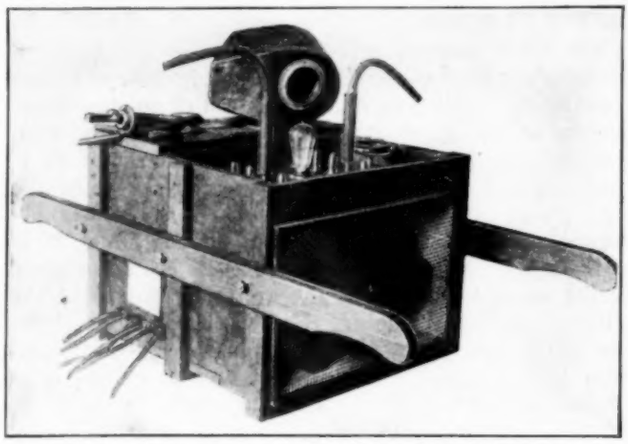


FIG. 334. APPARATUS MADE BY THE ELECTRIC ARC CUTTING AND WELDING CO.

better power rate can be obtained. In polyphase circuits where more than one set is used single-phase sets can be distributed among the several phases.

The outfit can be made especially for welding and for cutting or for combination welding and cutting and can make use of bare wire, slag-covered, gaseous fluxed or carbon electrodes. An operator's mask and the electrode holder used may be seen on top of the apparatus.

General Electric Lead-Burning Transformer

This lead-burning transformer, Fig. 335, a product of the General Electric Co., Schenectady, N. Y., can be used for lead burning, soldering electric terminals, splicing wires and tinsmith jobs, and even brazing can be done by placing the work between a blunt carbon point and a piece of cast iron. The transformer is designed to be connected to the ordinary 110-v., a.c. lighting circuit. Heavy rubber-covered terminal leads are used to convey the low-voltage, heat-producing current to the work, one terminal ending in a clip for fastening to some convenient portion of the work while the other terminal has a carbon holder arranged with an insulated handle. When the welding carbon is brought into contact with the work the pointed end becomes intensely hot and melts the metal over a restricted area. It should be noted that no arc is drawn, the end of the carbon point being heated to such a temperature that the metal in the vicinity is melted. The device uses about 800 watts while in actual use, the consumption dropping to 4½ watts when the point is removed from the work. It is stated that the device is very convenient in plumbing, roofing and tank-building jobs, as well as other such work.

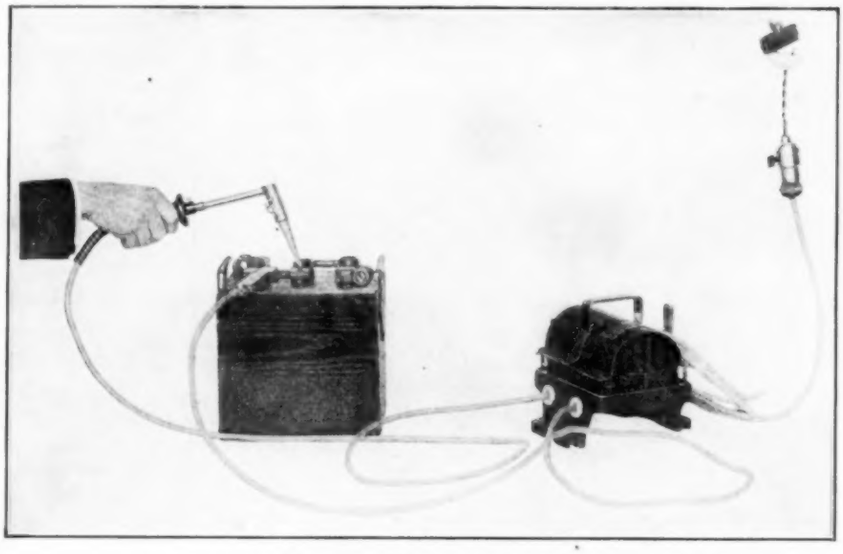


FIG. 335. GENERAL ELECTRIC LEAD-BURNING OUTFIT

Gaging Employees' Magazine Results

By JOHN T. BARTLETT

The plant paper furnishes a means of contact between the company and the employees. It is run much on the order of any advertising scheme, usually for the promotion of the morale of the workers. The author tells of means of estimating the results obtained by such papers, and also of means of getting results through them.

NO CONCERN publishes an employees' magazine for the fun of it. The paper is either going to pay or it isn't. If it doesn't pay it is going to be dropped. How are you going to tell whether a plant paper is a success or not?

Several hundred employees' magazines are now being published. Many more will be; some inevitably will die. Some are going to be "killed" when they ought to be maintained, and others in urgent need of first-aid treatment of a vigorous kind will be continued unchanged—all because the employees' magazine is a new institution, and uncertainty is common concerning the proper way to gage results, and even the sort of results to look for.

A manufacturer can study his product, determine what it is costing him to produce and distribute it and reckon what the margin of profit is. But with an employees' magazine, at the end of a year's operation you can't use any such simple process of figures. The results are mainly indirect. They consist principally of intangibles on the value of which it is difficult to put a convincing appraisal.

Advertising is a commonly used business device which naturally suggests itself in relation to this phase of the employees' magazine. Advertising during one period was frequently adopted by over-enthusiastic persons with much too rosy anticipations. It was considered a magic process which, when invoked, automatically and quickly brought wonderful returns. If the returns didn't come at once, the advertiser's enthusiasm flickered out. He concluded that advertising as a device to build business was a "false alarm."

Some publishers of plant papers, it is a foregone conclusion, will make the same mistake. The employees' magazine is rather a new idea, but numbers have already lived and died. Just as it has happened many times with advertising campaigns, so now it happens with employees' magazines, that after a paper has been published for a few months, the company may begin to look for some marvelous transformation in the working spirit of its employees, and when this is not apparent, to conclude that the device is not worth while. Persistence is indispensable to sane, successful advertising and it is also indispensable in the plant publication. Clever handling plus persistence is the recipe for results.

Results You Can Put Your Finger On

In gaging plant publication returns, one way is to look for accomplishments you can put your finger on. There are actually tangibles of this sort.

The relation of the paper to company welfare measures is one field to survey. If the publication has worked heartily for the company's savings plan, and the percentage of the employees participating in it grows and grows until it is the largest ever, the magazine has done something there that you can put your finger on. Company sports in which many participate are a healthful, constructive thing, for both the men and the company. A plant paper which stimulates company sports and is instrumental in bringing out the largest possible number of candidates, is doing something tangibly worth while.

Or, the paper may have rendered signal help in a ticklish situation. An incident in this field came to the writer's notice some time ago when an employees' magazine editor, in sending me a copy of his latest issue, apologized for it, explaining that it had been "rushed through." Then he told me why it had been. The men performing a certain very important operation had gone out on an unauthorized strike. The labor body having jurisdiction over most of the trades employed in the plant, but not over the one striking, had taken the company's side and assured the company, known as a supporter of the closed-shop principle, that it might employ non-union labor in the emergency. So far so good, but the firm didn't wish to employ non-union help. Here was the dilemma. A portion of the plant was already thrown out of work because of the unauthorized strike, and unless the strikers or substitutes soon resumed work, the whole plant would be made idle. On the other hand, if the firm employed non-union men, there was danger of the other union workers refusing to work, despite the mandate of the council, and a general strike.

"Not much of an issue," the editor said in effect. "Been having hourly conferences with L. M. (the company head), and finally decided to publish a little ahead, and talk plain."

I examined the issue, I confess, with some eagerness. The "talk plain" of the editor's letter was simply a frank review of the situation, including the assurance received that the company might go ahead and employ non-union men. The company said it didn't want to do this, and told why. It endorsed the closed-shop and was a friend of union labor. On the other hand, the trouble threatened to throw many hundred innocent employees out of employment and cause loss which could little be afforded. The company did not state definitely what it intended to do, but it paved the way for the employment of non-union men, if that should become necessary. It "put it up to" the striking employees. There was no general strike. The company steered safely through, and production was shortly on a normal basis.

In some industries more than in others the tangible value of having a mouthpiece for such possible emergencies as the foregoing is great. It furnishes one means of contact between the company and the men when the need arises.

Respecting results which "stick out," the management of the plant paper, and also the local circumstances, have much to do. Many editors tread lightly on material of a propaganda nature, believing it better judgment

to have the publication first of all a pleasant, entertaining sheet. The degree with which others campaign along various specific lines differs a great deal. One magazine editor has attacked certain wasteful practices, trying to drive home the idea that the workers owe it to the company to be careful. He says he expects to save the cost of the publication in the waste averted on two items. Allow for a little over-optimism, and it is apparent that he has accomplished a great deal in one field.

If the experiences of all employees' magazines could be tabulated they would be found to contain a fairly numerous list of constructive results upon which a finger could be placed. There would be a great diversity in the character of such accomplishments. Much of this is inside story stuff and hard to get at, but its existence is no less real.

Influence on General Morale

Employees' magazines are usually published for their influence on the general morale. A clear survey in this field is hampered by conditions surrounding circulation. The employees' magazine differs from the orthodox publication in that its distribution is free. Every employee is conceived of as an eligible reader, and in practically all cases an endeavor is made to attain 100-per cent circulation. The magazine is given an employee whether he asks for it or not.

Here, at the outset, the employees' magazine runs into a snag, or seems to. There are going to be instances in which some employees manifest little interest in the paper. After the distribution, a survey of the plant is going to reveal, many times, thrown-away copies. The degree to which lack of interest will be thus revealed will vary much, depending on the type of employees and the internal situation. A rational attitude toward such disquieting evidence is best maintained by viewing the problem as an advertising one. The company has certain ideas it wishes to sell employees. It wishes to educate them to a better feeling about things. If their viewpoint can be swayed to become sane and wholly constructive both employees and employer are going to be benefited.

But to assume that because a person works for the company he or she is bound to be interested in a plant paper is ignoring people as they are. Some people will read anything handed to them, and even aren't at ease on the street cars unless their eyes are fixed on car cards. For others, print, in itself, has no attraction whatever. There are millions in this country who don't read a piece of fiction in a year, and can't get interested in it. The newspaper is the most widely read publication there is. It reaches the highest proportion of possible readers. Yet the newspaper, dealing in news, the variety of printed material most primitive and elemental in its appeal, is "going some" when it is read by seven out of ten families in its territory. And it should be remembered that the newspaper is read by people who read nothing else. Practically speaking, everybody who reads peruses the newspaper, yet no newspaper is ever able to interest all to the point of regular reading.

These facts should be borne in mind when it is realized that an employees' magazine has a problem on its hands in getting read. The fact that a percentage of employees manifest lack of interest doesn't indicate the failure of the publication, but rather the existence of a problem. A manufacturer takes it for granted that, under normal conditions, persistent, energetic effort is associated with the sale of his product. He doesn't rave at the nature of things or throw up his hands because a prospect is only to be landed with persistent effort. Facing such a condition, what does he do? He hammers. The same tactics in successful employees' magazine management are necessary. Hammering and the persuasive message account for advertising and selling success, given a meritorious product. Accomplishment of results with plant publications must respect the same principles.

So, in gaging progress, not the existence of some uninterest, but the movement of that uninterest, whether growing or decreasing, should be the test applied. Every endeavor to cut it down should be made. If definite progress is being made in this direction, if employees are growing to like the paper and respect it, so that they receive each issue with growing anticipation, then the enterprise is making good. As a healthy, normal paper, constructively American and a sincere exponent of mutual co-operation, its ultimate influence for great good among employees is inevitable. Employees who receive the paper in this spirit simply can't escape its influence. All the laws of suggestion which have made advertising the great business force it is are behind it.

Method of Distribution Important

If the employees' magazine doesn't appear to be coming along as fast as it should, constructive measures—still viewing the problem as educational and one in which persistence is naturally required—are practical.

One well-known plant publication is distributed only to employees who apply for it. Psychologically, the average human is so constructed that he gains interest in an article from asking for it, just as he values a thing more which has cost him something. This plan is said to be successful in the case mentioned.

The consensus of opinion at present, however, does not favor this method. The management has certain ideas which it is anxious to sell the workers; it plans to sell them through the printed page, a medium with which, working month after month, it can build toward large ends. The fact that an employee is not interested in a plant paper is no reason why the company should not wish him to have it and read even a little of it. Some consumers will pass a billboard a dozen times without noticing the advertisement of "Crispnut" butter thereon. Then they will pass it fifty times more before, through reiteration, that particular brand is made especially attractive to them. The advertiser naturally likes voluntary attention, but if he can't have voluntary attention he turns to forced attention. Most advertising starts out with some form of forced attention. Some varieties of advertising, like billboard and moving picture, are built entirely on it. Its importance in the periodical field is attested by the premium paid for preferred position.

There is a Pacific Coast shipyard which distributes the employees' papers when the men are in line for their pay. The paying-off process is tedious, and the employees' paper is greeted as a relief, in addition to the normal interest in it. You could call this a trick to get the paper opened and read. Call it what you will—it's a good idea. Another idea is to pass the papers out as the employees leave the plant at night,

boys standing at the main exit. It is figured that by this method more papers are carried home. Another strategic time is the dinner hour.

If the employees' magazine doesn't seem to be progressing, judged by reader interest, any of several practical "first-aid" measures are easily applied. The magazine may not be lively enough. Heavy emphasis on personal items is good medicine. Snapshots also brighten up a publication wonderfully; their appeal is universal. Some employees' magazines use none; one I know of sometimes uses as many as ninety in an issue. In between are all degrees, but I have yet to see a paper that used too many. Use a lot of photos in that paper which hasn't been "coming along," and watch results. When the girl employees are the ones backward in interest, go after them with a woman's page. A goodly number of papers have successful departments of a social and home nature for the women.

That one or two, or even seven or eight, issues of an employees' magazine should completely alter the working spirit in a plant is asking too much of human nature. If workers earning much, in a period when work is plentiful, get off their base somewhat, to use the expressive colloquialism, it is only human. These conditions, as well as the "false prophets," are opponents of the plant paper.

The Evolution of the Engine Lathe

By Harry Senior

In an article on page 184 of *American Machinist*, reprinted from *The Link*, J. E. Franzen tells us that the engine lathe is so-called because it came into general use as a power-driven machine contemporaneously with the development of the steam engine.

While this is an ingenious explanation it is hardly conclusive for the reason that, though we have engine lathes, we have no engine planers, engine slotters, etc.; machines whose periods of development correspond very closely to that of the lathe and which as certainly derive their power from the same source.

I am not a student of history nor of philology, and I frankly confess that I do not know why the mechanics of a century ago prefixed the word "engine" to the name of their most versatile tool, but the term seems to me to have such a very obvious origin and meaning that there should be little doubt about it.

The word engine in old English signified a device that once set in motion was capable of accomplishing of itself the object for which it was designed. Webster says that it was formerly applied to almost any kind of mechanical appliance and it is still retained in some instances as "fire engine," "beer engine" (now obsolete), "ruling engine," etc. A machine designed to destroy life or property is commonly called an "engine of destruction." Likewise we have "dividing engine," "gear cutting engines," etc.; machines that, when once the preliminary calculations and adjustments are made, are capable of continuing the cycle of operations to its completion.

Even as applied to the steam engine, the right of which to the title is unquestioned, the word has the same significance: A steam engine, strictly speaking, does not generate power; it merely converts the power generated by the burning fuel into motion that can be utilized to accomplish useful work. The water, the steam, the valves, the moving pistons are but links in the chain of conversion. The steam engine is therefore an engine because it converts power from a definite source (the boiler) into motion; the lathe is an engine because it converts motion into useful work.

This is my belief; unsupported by anything but logic. If Mr. Franzen's theory is correct, and the engine lathe is so-called because of its connection to its prime mover we narrowly escaped having a "waterwheel lathe" to explain.

Increasing the Output of Labor

By J. E. Bullard

After the Civil War the output of labor was very materially increased by the adoption of machinery. Work that had previously been done by hand, began to be done by machinery. This was especially the case in the woodworking industry, and in other industries where it was necessary to increase production.

Since the end of the last war we have been faced with a very serious shortage of material, both the raw and the finished product. It is going to be necessary to greatly increase the output of labor if we are not to meet disaster.

There is, however, not much opportunity of doing this along the line of introducing more machine methods. About all that can be done along that line has already been done. The course that offers the greatest promise appears to be to pay more attention to the human machine, the worker himself, with a view of getting more out the machines through him.

From an energy standpoint, the human being is a sort of combination boiler and engine room. The food that he eats is his fuel. The air that he breathes burns this fuel and it is only when the right combination of food and air is made that the maximum amount of energy can be produced. If the average workingman could be fed the right kind and the right amount of food at the right times; if as much attention was given to his feeding as is given to the stoking of boilers, and if the air that he breathes was given as much attention and controlled as carefully as is the air that is supplied to the boiler fires, there is no question but that, in spite of himself, he would turn out at least 50 per cent more work than he actually does under present conditions.

It is obvious that it will not be possible to have such complete supervision over the human-being fuel (the food that he consumes) but it is possible to control the air in which he works. In other words to control the drafts of the fuel furnace.

In order to have this air supply result in the most efficient operation of the human engine it is necessary to have it meet three requirements: It must contain the right percentage of moisture. It must be at the right temperature. It must be sufficiently free from adulterations of bacteria, germs, and poisonous gases. It is somewhat hard to say just which of these three things is most important. If the air is perfectly pure but the temperature and humidity are not right, then production falls off. Any one or two of the three requirements may be just right and the third be bad enough to come very near completely offsetting any advantages that have been gained.

Cotton mill men have given it as their experience that the humidifers that they use to keep the humidity of the air in the mills uniform in order that the threads will not be broken, have had the result of making the

employees more keen and active, that these machines actually reduce the time lost due to colds and the like and that in this way they have tended to cut down the cost of operating by increasing production. No argument is needed to show that pure air is necessary. Everyone knows that foul air is extremely dangerous to health and that it is not possible for any person to do his best work unless the air is pure.

Any one who has made tests along these lines also realizes that there is a certain temperature which results in the greatest production. This temperature will vary with the kind of work that is being done. A temperature that will prove comfortable and energizing where light work is being done may be altogether too high for another kind of work requiring more muscular energy which in turn will generate body heat. It is, to a certain extent, a case of fitting the temperature to the kind of work being done.

This question of air is one which can be given a great deal more attention than it has ever been given before. It is the thing more than anything else, that can be controlled by the plant, which determines the degree of energy of the workers. That which finally determines the best conditions is the condition of purity, humidity and temperature which results in the greatest possible production. Pathological, physical and chemical calculations and tests only aid in reaching the ideal conditions. There is only one thing that will show when they have actually been reached, and this is the record which shows the greatest possible production per worker, and the least possible time lost due to sickness. This means that the best conditions can only be arrived at by experimentation and carefully kept records.

All sorts of welfare work will not get results if the workers have to work in an atmosphere that is enervating. The correct working atmosphere will get the right results in production, no matter whether any welfare work is done or not. If you feed a gas engine a certain mixture of gas and air at a certain rate, that engine will run at a certain speed. Make the mixture absolutely correct and increase the rate at which it is fed to the engine and that engine will run faster. It will have to do so.

Put a man into a certain atmosphere and set him to work and he will work at a certain speed. He will be unable to exceed a certain maximum effort in that atmosphere and maintain the effort. Make the atmospheric conditions ideal for the greatest production and that man will speed up. He will have to do so for the very simple reason that he is generating more energy. He is in exactly the same condition as the gas engine with the right mixture being fed to it at a rapid rate.

When we speed up the energy, however, it is highly important that we keep it upon the right track and do not allow it to result in destructive effort. On a railroad, the heavier the trains and the faster they run, the more necessary a good road bed becomes and the heavier the rails that must be used. If the road bed is not improved and heavier rails used as the weight of locomotives and trains increases and the speeds at which they are run become greater, accidents are going to increase and in the end little if anything has been gained.

Lighting in the industrial plant corresponds to the rails and roadbed of a railroad. Where the air is very bad and the temperatures and humidities are such that they reduce the energy of the working man, good lighting may not be entirely essential. The man won't do enough in the course of the day anyhow so that he either can make or spoil much. Where the atmospheric conditions, however, are such as to fill him full of energy, he is bound to spoil a lot of material and possibly meet with an accident himself if the lighting is so poor that he cannot see clearly what he is doing.

Air and light go together. The better the air conditions, the greater the energy of the people who work in the plant. The better the lighting conditions, the more productive this increased energy can be made. Improve one without improving the other and the best results can never be obtained.

Just how much artificial lighting is required for the very best results has not yet been determined. Up to date when it has been thought that the very best conditions have been reached, it has been found that production can be still further increased by increasing the amount of light used. Probably the maximum is somewhere near the amount of light that we have at noonday on a bright sunny day.

In all lighting, however, that which is by far the most important is freedom from glare. A light shining directly in the eyes of any one not only cuts down his productivity but increases the accident hazard. Place the lights where the worker can't look directly at them, increase the amount of light that falls upon his work and he immediately increases the amount of work that he does. He usually does this without realizing it. It has become so much easier to produce that he does better and more work than he has been doing heretofore and with less effort than he has been putting forth.

If in all of our manufacturing plants in this country we could bring about the best conditions of light and air, there is no question about the production increasing at a great enough rate to catch up very shortly with demand. At the present time it is doubtful if there is a single plant in the world that comes up to the ideal. Improvements are constantly being made in lighting installations that had already been made as nearly ideal as was thought possible. These improvements in illumination almost invariably result in worth-while increases in production. This indicates that there are no plants with lighting installations so perfect that they cannot be improved.

The amount of moisture in the air is rarely given the attention that it deserves, except in cotton mills and similar plants where such attention is necessary in order to turn out a satisfactory product. The percentage of moisture in the air, however, has just as great an effect upon the productivity and the health of the operator as it does upon the cotton threads. Ventilating systems do not always work as they are expected to work. Merely removing a certain volume of air from the room per hour does not necessarily mean that the air in all parts of the room has been changed. The final test in all cases is the productivity and loss of time through sickness of the people working in the different parts of the room. It matters not what the theory may be, what really counts is getting greater production from the man on the job and having him lose the minimum amount of time due to sickness. Records made of each condition under which he works will show which condition gives the best results.

Obtaining the Radius of Three Equal Inscribed Circles

On page 1055, Vol. 52, of the *American Machinist*, there appeared a letter by Henry R. Bowman under the above title. Three different solutions to the problem—which is to determine the radius of the three equal inscribed circles in terms of the side of the circumscribing equilateral triangle—have come in since that time, all of them being simple and worthy of examination.

Mr. Bowman states that the solution of his problem could not be found in any handbook. The writer refers Mr. Bowman to "Practical Mathematics," by Palmer (McGraw-Hill Book Co.), where he will find, page 72, part 2, a similar problem giving the relation between the very two elements in question. In fact, it is Mr. Bowman's problem reversed.

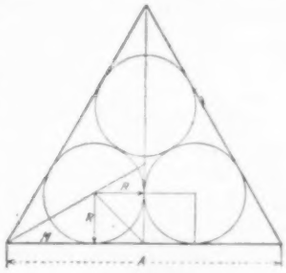


FIG. 1. DIAGRAM SHOWING THREE EQUAL INSCRIBED CIRCLES

Mr. Bowman's problem solved by this method begins as follows: It can plainly be seen by the figure (1) that side A of the triangle is composed of two equal segments M plus two radii of the circles.

The equation then can be formed thus:

$$\frac{\frac{R}{A - 2R}}{2} = \tan 30°$$

The writer believes the solution of this equation for either of the unknowns to be simpler than Mr. Bowman's method of solving the problem, since it does not deal with oblique triangles. It also eliminates the necessity of looking up more than one trigonometric function or an oblique triangle formula, as few people carry these formulas in their memories.

B. E. TOOL.

An easier way to obtain the radius R of three equal circles which will be tangent to the circumscribing equilateral triangle and to each other, is shown in the following work, referring to Fig. 2:

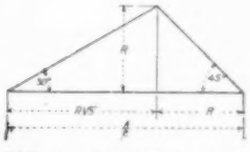


FIG. 2. SHOWING RELATION BETWEEN RADIUS AND SIDE OF TRIANGLE

$$R\,(\sqrt{3} + 1) = \frac{A}{2}$$

$$R = \frac{A}{2\,(\sqrt{3} + 1)} = \frac{A\,(\sqrt{3} - 1)}{2\,(3 - 1)}$$

$$R = \frac{0.7321\,A}{4} = 0.183\,A$$

GUSTAF E. NORDSTROM.

The following solution may be of interest, inasmuch as only one function is used instead of three, as in Henry R. Bowman's article.

Referring to Fig. 3, by geometry the radius R is at right angles with the altitude; and a line passing through an apex of the triangle and the center of the adjacent circle will make an angle of 30 deg. with the base, as shown. Therefore:

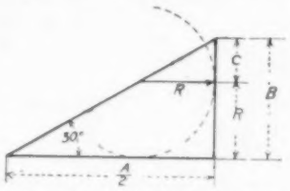


FIG. 3. DIAGRAM FOR CALCULATING RADIUS OF CIRCLES

$$R \tan 30° = 0.57735\,R = C.$$

$$R + C = R + 0.57735.$$

$$R = 1.57735\,R = B.$$

$$B = (\tan 30°)\,\frac{A}{2} = \frac{0.57735}{2}\,A$$

$$\therefore\ 1.57735\,R = \frac{0.57735}{2}\,A$$

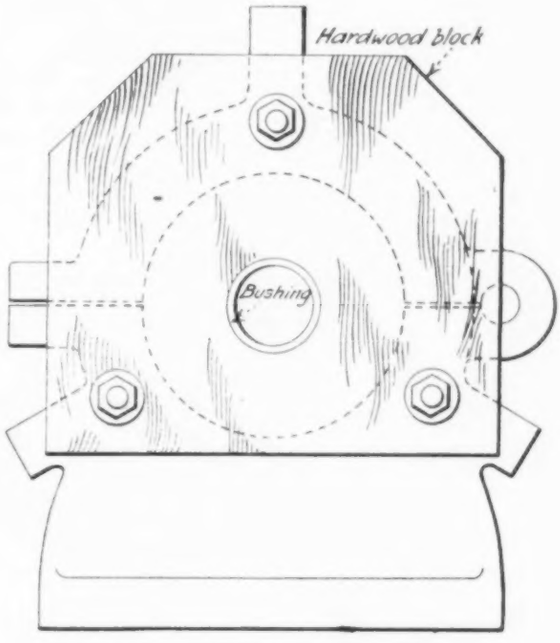
$$R = \left(\frac{0.57735}{1.57735 \times 2}\right) A = 0.183\,A.$$

LEO A. BRENNAN

Hardwood Steadyrest Guide

BY H. H. PARKER

Sometimes it is desired to turn a piece of finished work which must be supported in a steadyrest and where there would be danger of cutting the work if held in the regular jaws. This can be avoided by bolting a hardwood block across the steadyrest frame after removing the jaws, using, if possible, the bolt holes of the jaw-clamping bolts. A hole of the required

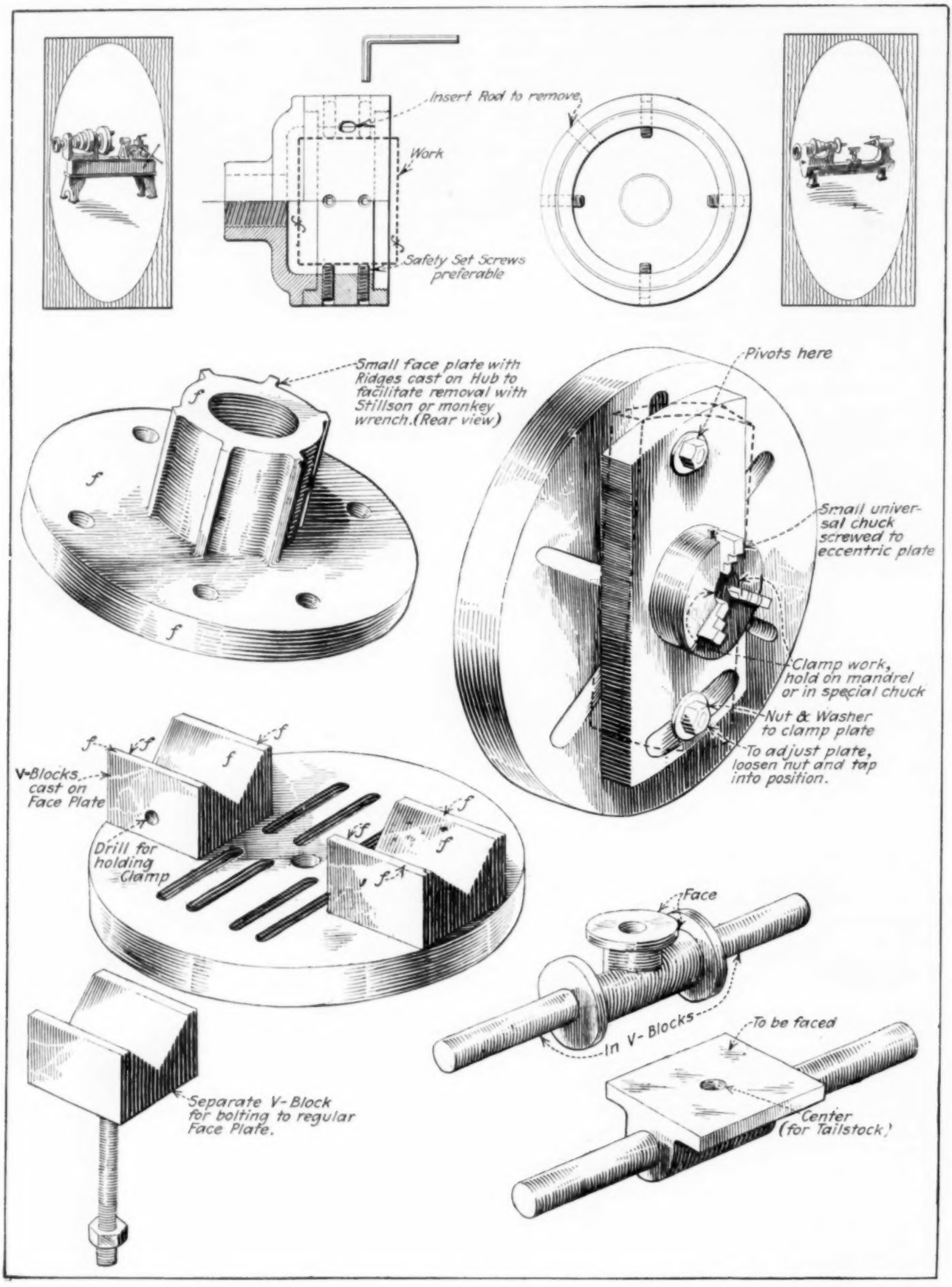


HARDWOOD GUIDE FOR STEADYREST

diameter is made in the block and if the bolt holes are larger than the bolts, the block may be aligned by tapping into place before finally tightening the bolts. In some cases it would be preferable to insert a brass or bronze bushing in the hole, or babbitt could be poured in and the opening reamed out to the required diameter. This is one way of turning keywayed or flatted work in the steadyrest.

Lathe Kinks

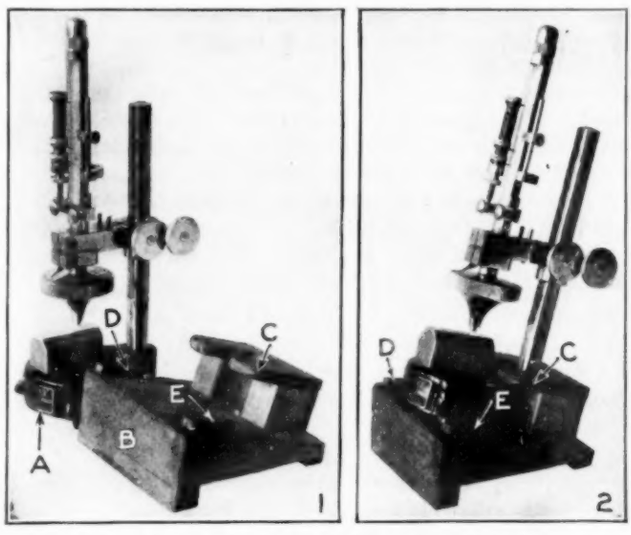
By H. H. Parker


Insert Rod to remove
Work
Safety Set Screws preferable
Small face plate with Ridges cast on Hub to facilitate removal with Stillson or monkey wrench. (Rear view)
Pivots here
Small universal chuck screwed to eccentric plate
Clamp work, hold on mandrel or in special chuck
Nut & Washer to clamp plate
To adjust plate, loosen nut and tap into position.
V-Blocks cast on Face Plate
Drill for holding Clamp
Face
In V-Blocks
To be faced
Center (for Tailstock)
Separate V-Block for bolting to regular Face Plate.

Tilted Stand for the Prestometer

By William Older

We have a great deal of comparing to do with the prestometer. The one we have was bought with the anvil parallel to the bottom of the base as shown at *A* in Fig. 1. This form of base is satisfactory for a great deal of our work but there are some pieces which are handled to better advantage with the instrument on a tilted stand. Our first idea was to make a stand with a quadrant so that it could be tilted over to the desired angle no matter what that might be. Before starting to make anything so complex, however, we decided to get out a simple tilted stand, as shown at *B*, Fig. 1. This was made of some scraps of mahogany from the pattern shop. The stand is about 6 in. square and gives a solid support for the instrument. A recess at the back accommodates the post. The ½-in. flange *C* just clears the top of the back of the base. Two ½-in. high lugs *D* and *E* on each side of the front just clear the projecting feet of the prestometer and prevent it from moving sidewise. Flanges could be put on top of the lugs *D* and *E* so that they would project over the feet. This would be necessary only if the angle at which the instrument is tilted is such that there would be a tendency for it to tip over backwards. Fig. 2 shows the instrument in place on the tilted stand.



FIGS. 1 AND 2. ARRANGEMENT OF PRESTOMETER AND STAND

Fig. 1—Prestometer and tilted stand made of wood. Fig. 2—Prestometer in place on the tilted stand.

Quick-Operating Clamp

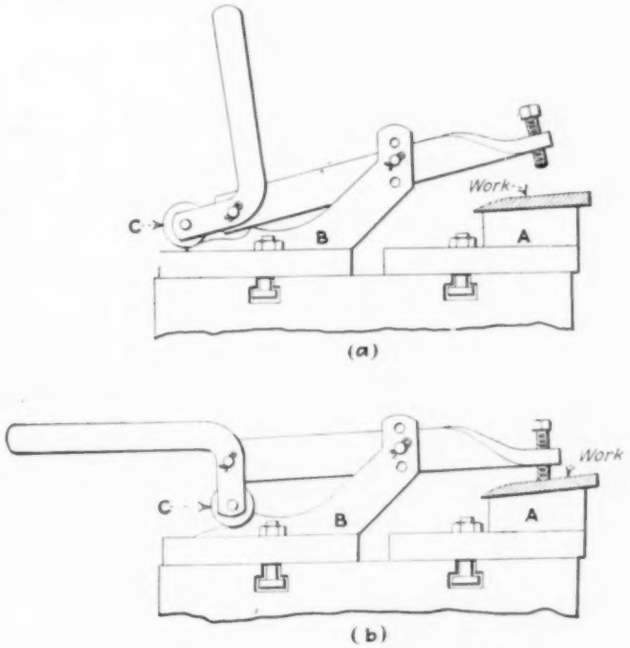
By H. M. Johnson

The clamp shown in the accompanying illustration was designed for use on a grinding machine to hold a plow share while grinding the rear edge on a cupped wheel.

The work is laid on the fixture *A* and located by pins not shown. The clamp is arranged to give a generous opening over the fixture, as shown in (a), to facilitate placing the work. Pressing down the handle causes the clamp to approach the work, rapidly at first, but finally with a slow, powerful movement as the roller *C* climbs the cam surface. The roller goes very slightly past center and stops against the end of the cam track, as shown in (b).

The bracket *B* has three pivot holes drilled to permit a wide range of adjustment in height. The setscrew takes care of small adjustments. By making the clamping device separate from the workholder, one clamp will serve a large number of fixtures. I have used this same clamping principle on a drill jig with good results.

The proportions of the levers were much different, but the principle involved was the same.



FIXTURE AND QUICK-OPERATING CLAMP

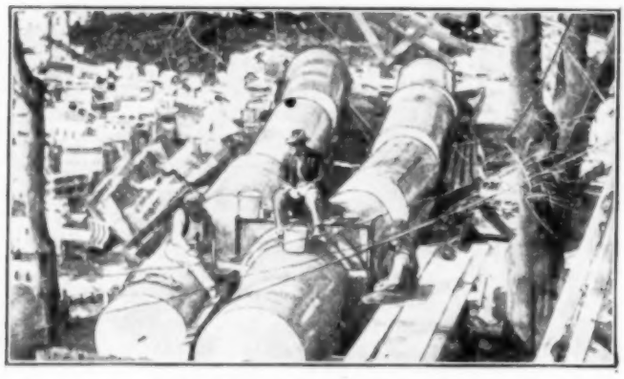
Hand-Sawing 3-ft. Cold Rolled Rounds

By E. A. Dixie

The illustration shows a job which was recently done on some columns for the new Times building, Hartford, Conn. The columns are granite. They had been *rolled* into the yard in place for cutting and the temperature was but a few degrees above freezing, so there is no deception in the caption.

When the Parkhurst church, New York, was razed a great part of the material was bought by the proprietors of the Hartford *Times* with a view to using it in the construction of their new building.

The columns are a little over 3 ft. in diameter, made up of several sections each about 9 ft. long. Certain of the sections had ornamental flanges cemented to them which had to be removed. Some of them came away from the cylindrical portion without much trouble, wedges being used to start a crack in the cement which held them together. There were others which positively refused to yield to this treatment so it was decided to saw them apart. The equipment consisted of an old



HIGH-SPEED HAND SAWING

two-man cross-cut wood saw, a bucket of water and one of sharp sand. The personnel, or organization, comprised three men. About four times daily during the week or so while they were cutting the flange off I passed the scene of their operations and can vouch for the fact that on at least one occasion I saw as many as two of them working at the same time. In order to plot an authentic motion study chart of the job, which would indicate the functions of each of the three men, I interrogated all the men in our shop which is just across the street from where the work is being done.

Sons of Rest

Of our force of 250 men there were 133 who said the three men were:

"Statues from Parkhurst's church, Judas Iscariot, Annanias and Pontius Pilate or some other of them 'Ginney' saints, to judge by their mugs."

One hundred and fifteen said that the three were giving a demonstration of "New Thought," or the power of mind over matter, as they seemed to be trying to wish the saw through the column.

The remaining two of our men had seen each one of the three in motion on various widely separated occasions.

From data culled from them and added to my own observations the flanges were separated in about the following manner:

The cement on top of the joint, between the column section and the flange, was scratched with a cold chisel till the scratch was deep enough for the saw to follow it. The saw was then reciprocated by the two men on each side of the column while the one on top occasionally dribbled a little water and sand in the kerf. When the saw was once in the kerf between the two sections of granite it automatically followed the joint, as the cement was softer than the granite.

It took the three men over a week to make the cut.

There was a small gasoline engine on the contract which could have been rigged up by any intelligent mechanic in three hours to do the job, and with it the cut could have been made in not more than a day and a half, saving at least 18 days' wages.

A Short Proof for Long Division

By Alan G. Wikoff

I have read with interest J. Madden's article, entitled "A Short Proof for Long Division," on page 480 of *American Machinist*. It may interest your readers to know that the process of "casting out the nines" referred to can be shortened considerably in the following manner:

Take Mr. Madden's first example, 8761. His procedure is $8 + 7 = 15 - 9 = 6 + 6 = 12 - 9 = 3 + 1 = 4$.

The resultant is obtained more simply by adding the digits together and continuing this process until a single digit is obtained.

Thus $8 + 7 + 6 + 1 = 22$; $2 + 2 = 4$.

The step of subtracting 9 each time is unnecessary. In adding the digits, 9's or numbers whose sum is 9, may be neglected.

As another example, taking his figures for proving subtraction:

$$\begin{array}{rrrr} 879654 & = 39 & = 12 & = 3 \\ 123007 & = 13 & & = 4 \\ \hline 756647 & = 35 & & = 8 \\ & 84 & = 12 & = 3 \end{array}$$

The process of "casting out nines" is thus reduced to straight addition which can be performed mentally with rapidity. I do not make any claim for the originality of this short-cut, since it is constantly used by bookkeepers and accountants.

It is also obvious that this method fails when an error involving 9 or some multiple of 9 has been made. While the probability of such an error is small, it may occur in addition and subtraction.

If, for example, the sum given on page 481 had been found on first trial to be 3760508 instead of 3850508, the proof would have indicated that the summations had been made correctly, for

$$\begin{array}{rrrr} 3760508 & = 29 & = 11 & = 2 \\ 3850508 & = 29 & = 11 & = 2 \end{array}$$

A few trials will show that any change involving 9 or a multiple of 9 will give the same "remainder."

Thus:

$$\begin{array}{rrrr} 3850517 & = 29 & = 11 & = 2 \\ 3851408 & = 29 & = 11 & = 2 \\ 3761408 & = 29 & = 11 & = 2 \end{array}$$

It is well to keep this point in mind, although it is seldom that it will interfere with the application of this proof.

World Trade Club Methods!

THERE was a notable gathering of business men in Paris in June of this year when American delegates met their European associates in the first meeting of the **International Chamber of Commerce.**

The advocates of the "Compulsory introduction of the metric system in the United States" presented to this body for adoption a strongly worded resolution, urging this country and Great Britain to discard their present system of weights and measures and in its place to compel the exclusive use of the metric system.

At the head of this movement was Albert Herbert, "Angel" of the "World Trade Club," of San Francisco. The resolution presented by Mr. Herbert bore his name as: "Chairman, Delegate of World Metric Standardization Council, World Trade Club, Foreign Trade Club, San Francisco." Five other names were signed to this resolution, among which was that of, Prof. George B. Roorbach, "Delegate of the Business Education Section of Harvard University, Boston, U. S. A."

The method employed in framing this resolution and what happened to it can best be gathered from a letter sent to the American Institute of Weights and Measures, and given below.

HARVARD UNIVERSITY,
GRADUATE SCHOOL OF BUSINESS ADMINISTRATION
CAMBRIDGE, MASS., Aug. 21, 1920.

Dear Sirs:

In reply to your letter of Aug. 6, I wish to state that the resolution introduced by Albert Herbert at the International Chamber of Commerce in Paris, and purporting to be signed by me, was done **without any authorization on my part.** I was astounded when I saw the resolution with my name attached. I not only did not sign this resolution but had no idea that such a resolution was to be presented and had previously indicated to Mr. Herbert that I had no wish to be connected with the introduction of any resolution on this topic. I had told Mr. Herbert that in a general way I was in favor of a greater amount of uniformity in the use of weights and other units for International Trade. I did not, however, know enough in regard to the particular matter under discussion to commit myself in favor of the metric system.

I would like to add that the resolution that Mr. Herbert sent out was not passed by the International Chamber of Commerce. **It was introduced, discussed, and definitely turned down.** When I vigorously objected to Mr. Herbert for the use of my name on the resolution, he stated that the resolution was mimeographed only for distribution among the delegates at Paris and that it was not to be given any wide publicity. I now find that he is sending it to various parties in the states, and I presume elsewhere, and giving the impression that it was adopted by the International Chamber.

Thanking you for bringing this to my attention, I am

Very Truly Yours,
(signed) G. B. Roorbach, Professor of Foreign Trade.

No comment is necessary.

Ethan Viall
Editor

WHAT to READ —for the man in a hurry

Suggested by the Managing Editor

THIS week we begin a series of articles on apprenticeship and special training programs in more than a score of the leading shops and plants of this country. Their appeal will be more particularly to employers, employment managers, superintendents, and other executives directly interested in the education and training of personnel.

The author is John Van Liew Morris whose expressive countenance appears on this page. Mr. Morris is a Harvard man and also wears a Ph.D. from Teachers College, Columbia University. Incidentally, the research work on which these articles are based was done while he was working for his doctor's degree. In addition to his university training he has put in eight years as a teacher, during six of which he was principal of a technical institute. His broad experience in his particular line is reflected in this series. The first article of the series discusses the various forms of training at the Schenectady plant of the General Electric Co.

What to read was not a difficult matter to decide two hundred years ago when books were few and magazines unheard of. It is far different now when so much reading matter is offered to pass the time pleasantly or profitably as the reader chooses. We are doing our utmost to make the "American Machinist" not only profitable but indispensable as a clearing house of ideas and news of the machinery world. This page is the editors' advertisement of their section of the paper. It gives the high spots.

Page 571 is the first of ten devoted to one of the deferred automotive cylinder articles by Fred Colvin that was mentioned last week. Starting with the methods at the Oakland shop which are given in considerable detail we are following up with the Studebaker and Essex practice. The three cylinders are widely different in design and consequently the contrasts between the practices of the three shops are interesting.

Following the automotive article is one by T. F. Stacy on spring design. This paper discusses springs of circular cross-section and includes valuable design charts.

On page 583 is the twenty-seventh of Ethan Viall's welding articles. This one is a continuation of last week's and describes the constructional details and operating principles of various makes of arc-welding sets, both stationary and portable. Suggestions for improving relations and working conditions in the shop are made by John T. Bartlett on page 589 and by J. E. Bullard on page 591. Mr. Bartlett tells of the possibilities of the plant paper in clearing up misunderstandings and Mr. Bullard takes up the important items of fresh air and abundant light and discusses their effect on output. Nothing so very new, perhaps, but it does no harm to remind people of these things periodically. The second and concluding part of Lineham's article on the hardening of screw gages with minimum distortion appears on page 604a (omitted from European edition). The author's conclusions are worth noting. Editorially, we feel it necessary to take one more crack at the viciously misrepresenting methods of the "World Trade Club" and allied interests. Page 597.

J. V. L. MORRIS

On page 599 is the tentative program for the first meeting of the American Engineering Council of the Federated American Engineering Societies. This most important meeting will take place in Washington on Nov. 18 and 19. In our opinion too much stress cannot be laid upon the fact that the formation of this organization is a matter of considerable consequence for all engineers. We have been guilty of repeating the facts about the Federation more than once but it has been done with intent for we are anxious that no engineer reached by the *American Machinist* shall be ignorant of the aims of the Federation and its significance for himself and other members of the profession.

First Meeting of the American Engineering Council of the Federated American Engineering Societies

THE Organizing Conference of The Federated American Engineering Societies, held in Washington June 3-4, 1920, was attended by 140 delegates representing over 71 organizations, having an aggregate membership of over 110,000, or over 80 per cent of the aggregate membership of all of the organizations that were invited. The questions have been asked:

"WHO ARE THESE MEN?"—
"WHO WERE INVITED?"
and—
"WHO SHOULD BE INTERESTED IN THIS MOVEMENT?"

The Federated American Engineering Societies is constituted of engineering and allied technical organizations, whose chief purpose is the advancement of the knowledge and practice of engineering and allied technical arts, which are not organized for commercial purposes. It includes the individual engineer and the allied technologist who is represented through the society or societies of which he is a member, which have membership in the organization. It includes civil, mining, metallurgical, mechanical, electrical, testing, railway, highway, municipal, hydraulic, sanitary, water-works, bridge, agricultural, illuminating, heating, ventilating, refrigerating, safety, radio, fire protection, automotive, industrial, military, marine, naval and chemical engineers, architects and naval architects, chemists and geologists. These branches of engineering and allied sciences cover the whole range of activity in this country upon which is dependent its economic success. It has been said that "EVERYWHERE YOU LOOK YOU SEE WORK THAT ENGINEERS HAVE DONE."

Engineers and allied technologists have been content to perform their work without notoriety. Dating from a period considerably before the war, the engineer was gradually developing class consciousness, and a desire to be of public service. This desire was intensified as a result of the World War and led to the formation of Engineering Council by the American Society of Civil Engineers, the American Institute of Mining and Metallurgical Engineers, the American Society of Mechanical Engineers, and the American Institute of Electrical Engineers. In the effort of these societies to determine in what way their activities could be improved and rendered of greater value, committees were appointed by each, and these committees in turn appointed conferees, who met and organized the Joint Conference Committee. As a result of this intensive desire for service, it was the unanimous opinion of the Joint Conference Committee that a comprehensive organization was desirable that could speak for the engineering and allied technical professions wherever engineering experience and technical training are involved, as well as in matters of common concern to these professions. This recommendation was accepted by the constituent societies who authorized the committee to call, without delay, a conference of representatives of national, local, state and regional engineering organizations and affiliations for the purpose of bringing into existence the comprehensive organization recommended. The committee issued a call to 110 engineering and allied technical organizations for the thoroughly representative Organizing Conference of June 3-4, 1920, which has been characterized as the greatest event in the engineering history of this country.

This organizing conference, without a dissenting vote, created The Federated American Engineering Societies and authorized the Joint Conference Committee to act as the Ad Interim Committee between its adjournment and the first meeting of its governing body, American Engineering Council.

The Federated American Engineering Societies already has an aggregate membership greater that that of any other engineering organization in the world. As has been pointed out repeatedly, the question is not whether this organization will come into existence but the number of members it will have; it already is in existence, and the Joint Conference Committee as the Ad Interim Committee representing it, is engaged in furnishing the organizations invited to become charter-members with information and other assistance to enable them to act intelligently on the invitation. From the advices already received, the committee can state that American Engineering Council will have a greater number of member-societies than Engineering Council and will also represent a much larger aggregate membership—estimated considerable in excess of 60,000. This meeting of the American Engineering Council will deal with the future work of the organization.

Program

Thursday, November 18, 1920

Morning Session

8.30 a.m. Registration.
10.00 a.m. Opening session of American Engineering Council.
1. Call to Order; Richard L. Humphrey, Consulting Engineer, Philadelphia, Pa., chairman of the Joint Conference Committee.
2. Election of Temporary Chairman.
3. Election of Temporary Secretary.
4. Appointment of the following Temporary Committees:
(a) Program; (b) Credentials; (c) Constitution and By-Laws; (d) Nominations; (e) Plan and Scope; (f) Budget; (g) Resolutions.

Afternoon Session

2.00 p.m. Address—"Engineering Council," J. Parke Channing, Consulting Engineer, New York, N. Y., Chairman.
2.30 p.m. Discussion of the field of activity for The Federated American Engineering Societies.

Friday, November 19, 1920

Morning Session

9.00 a.m.
1. Report of Committee on Nominations
2. Election of Permanent Officers
3. Report of Committee on Constitution and By-Laws.
4. Formal Ratification of Constitution and By-Laws.
5. Report of Committee on Plan and Scope.

Afternoon Session

2.00 p.m.
1. Report of Committee on Budget.
2. Report of Committee on Resolutions.

Evening Session

8.30 p.m.
1. Introductory remarks by presiding officer, the President of American Engineering Council.
2. Address (subject to be announced later) Herbert C. Hoover, President, American Institute of Mining and Metallurgical Engineers, New York, N. Y.

9.30 p.m. Informal reception and smoker

Saturday, November 20, 1920

9.00 a.m. Organization Meeting, Executive Board, American Engineering Council, of The Federated American Engineering Societies.

Alfred Herbert No. 5 Automatic Turret Lathe

SPECIAL CORRESPONDENCE

The development of automatic machinery follows slightly different lines in England than in the United States. One of the latest general-purpose automatic machines, representative of the best English practice, is here described. It has a number of patented features, and will be found to be somewhat different from the American automatic turret lathes.

THE illustration shows a turret lathe recently put out by Alfred Herbert, Ltd., Coventry, England, with offices at 54 Dey St., New York, N. Y. The machine has a maximum swing over the bed of 18½ in. and is known as the No. 5 model. All operations are automatic, except chucking, and the machine stops automatically at the finishing of a piece. There are a number of interesting features to the lathe, such as the longitudinal adjustment of the headstock, the independent operation of the front and rear cross-slides, and the low position of the spindle, which makes setting up an easier task.

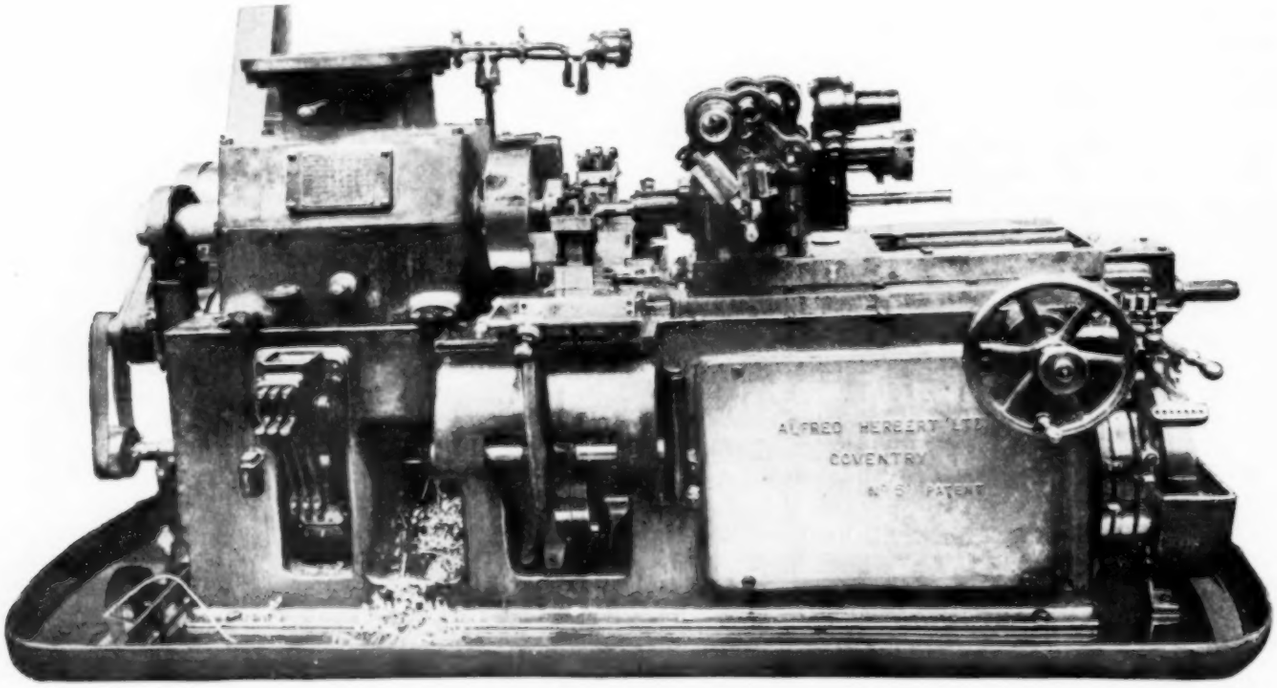
Constant-speed drive by a 4-in. belt is employed, the 10-in. driving pulley running on ball bearings. The drive can be engaged for starting the machine by means of a friction clutch operated by a hand lever. The headstock is adjustable along the bed for a length of 6 in. and its mechanism is completely inclosed, the gears running in oil.

There are five spindle speeds that are changed automatically. It is claimed that the changing is performed instantaneously and silently, and that it can take place while the tools are cutting, if necessary. Change gears are provided to give six principal or substantive speeds, by which the range of the automatically operated speeds is changed. Since these five automatically changed speeds can be used with each substantive speed, a total number of 30 steps is provided in a range from 14 to 411 r.p.m., the maximum gear ratio being 28.5 to 1. If desired, change gears can be furnished to give additional speeds.

The hollow spindle is 5¼ in. in diameter at the front neck and has a flange on the nose 10 in. in diameter. It has a bore of 3⅜ in., runs in white-metal bearings and is provided with a ball thrust bearing. It can be stopped automatically at any instant and then restarted automatically in time for the next cut. This action is valuable, particularly, to enable the withdrawing of a tool at the end of a cut without leaving a helical mark on the work.

The turret has four faces, machined square with the spindle. The tool holes are 2¼ in. in diameter. The turret is mounted on a slide having a working stroke of 13 in. It is indexed at the extreme back position and then clamped automatically.

The cam controlling the action of the turret con-



ALFRED HERBERT NO. 5 AUTOMATIC TURRET LATHE

Specifications: Maximum swing over bed, 18½ in. Maximum swing between cross-slides, 16 in. From spindle to face of turret: maximum, 34 in.; minimum, 15 in. Spindle to floor, 40½ in. Turret: number of holes, 4; length of working stroke, 13 in. Cross-slides: adjustment along bed, 7⅛ in.; transverse feed, 4½ in.; maximum distance from spindle, 11½ in. Horsepower, 7. Speed of driving pulley, 400 r.p.m. Spindle speeds: automatically changed, 5; substantive, 6; 14 to 411 r.p.m. Feeds, rev. per in.: turret slide, 16, 27, 48, 64, 83, 110, 144; cross-slides, 40, 68, 122, 163, 212, 280, 366. Floor space, 6 x 12 ft. Approximate weight: net, 8,500 lb.; gross, 10,100 lb. Boxed for export, 340 cu.ft.

sists of a drum running in oil and driven directly by a worm. It is provided with two grooves, one for moving the turret slide and the other for indexing the turret. Since the latter action occurs only when the turret is in its extreme back position, all of the working stroke is available for actual machining operations. The turret-actuating groove is cut like a screw-thread and returns upon itself, so that the turret moves with a smooth and steady motion. It is claimed that no irregularity or jumping occurs, even when taking heavy cuts. For each complete forward and return movement of the turret the cam makes three complete revolutions. Rotation of the turret to present a different tool to the work requires but 1.1 sec., and the time for a complete cycle of the machine at high speed is only 48 seconds. The turret is 11¼ in. in diameter and the centers of the tool holes are 4½ in. above the slide. The distance between the face of the turret and the face of the spindle varies from 15 in. as a minimum to 34 in. as a maximum.

Cross-Slides

The front and back cross-slides are independent of each other in their action, and can be set to work either at the same time or separately, as required. For example, roughing and finishing facing cuts can be taken simultaneously. The cross-slide cams can be adjusted to operate at any part of the cycle of operations. Each cross-slide is provided with a double toolholder and a stop with screw adjustment for regulating the diameter turned.

The center of the spindle is 4½ in. above the top of the front slide and 3½ in. above the back slide. The slides have adjustments along the bed of 7½ in., independently of each other. The horizontal distance from the spindle to the cross-slides can be varied from nothing to 11½ in., power feed being available for a stroke of 4½ in. The maximum diameter admitted between the cross-slides is 16 in. Ample room is provided under the tools for the chips to get away, the chute for this purpose being plainly visible in the illustration.

Ranges of Feed

The "self-selecting" feed motion provides, for both the turret and the cross-slides, ranges of 7 feeds, any one of which can be brought into action instantly at any part of the cycle, even during a cut, if required. The feeds are driven from the headstock; but the quick or idle motions are driven from the constant-speed driving pulley, so that the idle motion always takes place at the same rate of speed. It is claimed that the range of feeds is sufficiently broad so that it is never necessary to change the feed cams. The feed of the turret slide varies from 16 to 144 rev. of the spindle per inch of feed and that of the cross-slides from 40 to 366 rev. per in.

The bed is a box casting. It is built low, the spindle being only 40½ in. above the floor, so that the machine can be tooled up and attended more conveniently. The tray extends the full length of the bed and provides ample room for chips.

A pump with fittings, including splash guards, is supplied at extra cost. Oil supply through the turret can be furnished for use with hollow tools for carrying lubricant to the cutting edges.

A back-facing attachment can be furnished if desired. It is claimed that its use often enables a piece to be completely machined at one setting instead of two.

The 15-in. Coventry chuck is suitable for use with this machine, although special chucking fixtures can be furnished for work that cannot be handled by it. A standard tool outfit can be supplied and the maker recommends its use for general work. The outfit includes a centering tool, facing tools for the cross-slides, boring bars and combination boring, turning, and facing tools that are provided with an overhead support.

The machine is intended to be driven by a 7-hp. motor. The floor space required is 6 x 12 ft., the approximate net weight is 8,500 lb., and the size when boxed for shipment is 340 cu.ft.

A Question in Factory Management

By H. L. Smith

In the *American Machinist* for August 19, W. Burr Bennett raises a question in factory management having to do with the establishment of a department for a new class of work.

Assuming that a comparatively small space of time will elapse before the out-put of the department will be great enough to employ a man full time on this new work, and assuming that the man selected is inexperienced in this work, but is ambitious and anxious to learn, he should be assigned to this work for his entire time.

Just as a Vestibule School is run for the training of new employees and the cost charged to the current burden of the operating department, so the wages of this man while he is learning should be charged as a burden on the department.

This will then reflect the actual condition which is that the cost of performing this work in the new department is relatively higher than it will be when the production is sufficient to occupy the full capacity of the man and of the department.

A Deferred Expense Account

If the expense of setting up and operating the department until it is on a production basis is large enough to warrant, it is advisable to establish a Deferred Expense Account to which all expenses incident to the establishment of the department, which are not of an asset nature, may be charged. This Deferred Expense is then divided into twelve, twenty-four or more parts and one part is charged into the burden of that department each month until the Deferred Expense is thus disposed of.

In this manner, it is possible to make the production of the following year or two or more bear a proportion of the expense of starting this department. This tends to keep the burden rate for that department more nearly uniform.

The man working a part of his time on production and spending the balance in learning his job is creating an asset to the company, the expense of which is thus distributed over the work of the future which is to profit by his experience.

The ratio of the expense of starting the department to the expense of the department after it is operated, helps to determine the period over which the Deferred Expense should be spread.

SHOP EQUIPMENT NEWS

-Edited By-
S. A. HAND

SHOP EQUIPMENT • NEWS •
A weekly review of modern designs and • equipment •

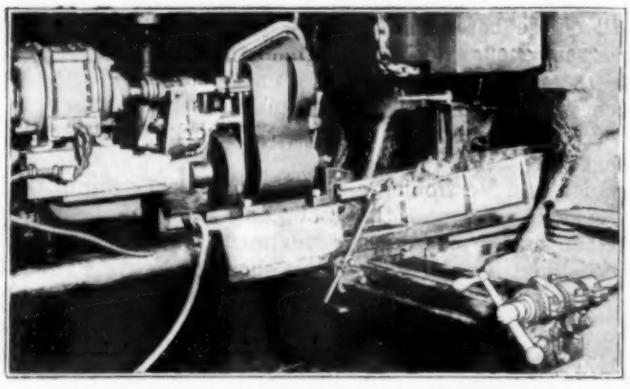
Descriptions of shop equipment in this section constitute editorial service for which there is no charge. To be eligible for presentation, the article must not have been on the market more than six months and must not have been advertised in this or any previous issue. Owing to the news character of these descriptions it will be impossible to submit them to the manufacturer for approval.

• CONDENSED • CLIPPING INDEX
A continuous record of modern designs • and equipment •

Whitcomb Blaisdell (Damerell) Portable Shaper

A portable shaper designed for truing up drop-hammer parts has been brought out by the Whitcomb-Blaisdell Machine Tool Co., Worcester, Mass., and is illustrated herewith.

The machine is distinctly a draw-cut shaper, is made in two sizes and is motor driven. It is claimed that the ram will stop in reverse within ¼ in. without overtravel, allowing the tool to cut close to corners and shoulders. The horizontal feed can be operated either by hand or automatically, while the vertical feed is by hand.



WHITCOMB-BLAISDELL PORTABLE SHAPER

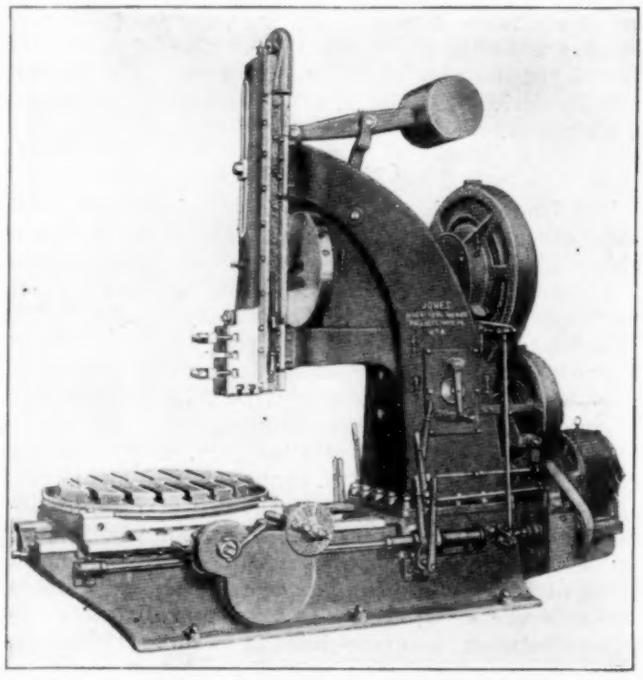
Specifications: Small size. Capacity; will plane 48 x 48 in. horizontally and 8 in. vertically. Large size: capacity, will plane 66 x 66 in. horizontally and 8 in. vertically. Motor, 3 hp. for both sizes. Speed; cutting stroke, 20 ft. per min.; return 40 ft. per minute.

Jones 20-in. Slotting Machine

The Jones Machine Tool Works, Media and Edgewood Sts., Philadelphia, Pa., has placed on the market the slotting machine illustrated herewith.

This machine has a single pulley drive and may be driven by belt from a two-speed countershaft or by direct connection to a motor. The drive is through a friction clutch and the ram can be quickly stopped by a brake. The feeds for the saddle, cross-slide and circular table are of the usual intermitted ratchet-type. All operating levers are conveniently placed and are in duplicate, complete sets being placed on both sides of the machine. Quick power-traverse is provided for all feeds and may be engaged without throwing in the main clutch which starts the ram.

The circular table is graduated on its periphery and in addition is provided with an indexing device. The feeds for the cross-slide and the circular table are interlocking so that both can not be engaged at the same time.



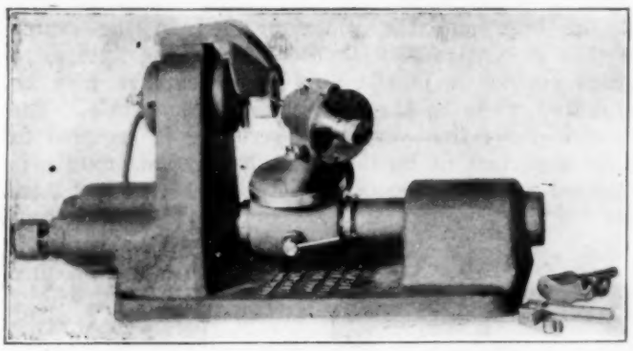
JONES 20-IN. SLOTTING MACHINE

Specifications: Speeds; four, 8 to 16 strokes per minute with constant speed motor; or, 8 to 42 strokes per minute with variable speed motor or two speed countershaft. Motor, 10 hp. Floor space, 7 ft. x 12 ft. 7 in. Height, 13 feet.

Gorton Engraving Cutter Grinding Machine

For grinding the cutters used on its engraving machines, the George Gorton Machine Co., Racine, Wis., has brought out the machine illustrated herewith.

The abrasive wheel is direct driven by a small high-speed motor incorporated in the machine. The motor is of the universal type and can be used with either d.c. or a.c. current. Motors can be furnished for any desired voltage. The tool to be ground is supported in a sleeve which holds it identically as it is held in the engraving machine, the sleeve being provided with indexing means for determining the cutting angle. The tool carrier has a graduated swivel-base so that the tool point can be presented to the wheel at any angle desired. The regular equipment includes an attachment for grinding the point of the stylus used in connection



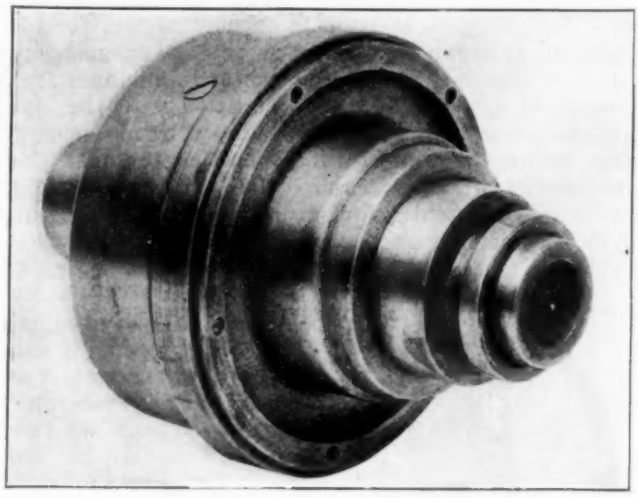
GORTON ENGRAVING-CUTTER GRINDING MACHINE

with the master plate on the engraving machine, also a holder for the truing diamond.

The machine as shown is intended for bench use, but can be furnished mounted on a pedestal if desired. Weight as shown, 75 pounds.

Mill Duplex Friction Clutch

The friction clutch shown in the illustration has recently been placed on the market by the A. Mill Clutch Co., 2116-20 Colerain Ave., Cincinnati, Ohio. Contact is made by means of both an expansion friction ring and two side plates, so that all of the surface available for friction inside of the case is utilized. When the clutch is operated, the ring engages first



MILL DUPLEX FRICTION CLUTCH

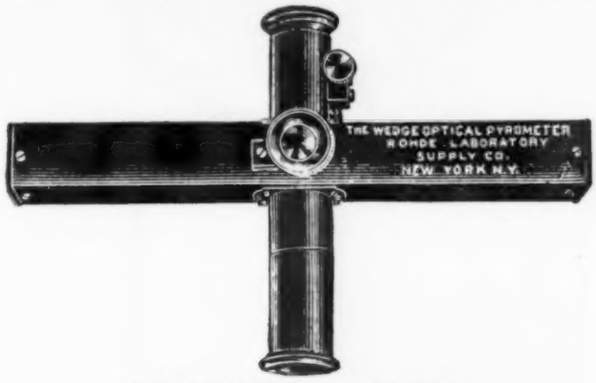
and then the side plates, thus securing a jerkless grip on the rotating shaft.

The case is said to be perfectly dustproof and capable of holding oil for a long time. The clutch is especially adapted to high speeds, can readily be engaged and disengaged and is easily adjusted for wear.

Wedge Optical Pyrometer

The Rohde Laboratory Supply Co., 17 Madison Ave., New York, N. Y., has placed on the market the instrument shown in the illustration, intended for the measurement of high temperatures and is known as the Wedge optical pyrometer. The instrument can be used whenever the object to be examined shows a distinct coloration due to heating. It is claimed that the size of the object or its distance from the pyrometer does not affect the reading.

The instrument contains an achromatic telescope, the objective of which focuses the image of the heated body on a movable prism. The observer views the image on the prism through the eye piece, exterior light being shut out by means of a shield. The prism is made of dark glass and can be moved across the field of vision by means of a rack and pinion. It is moved until the proper thickness of glass is interposed to just shut off the light emitted by the heated



WEDGE OPTICAL PYROMETER

body. At this point, when the image disappears, the temperature of the heated body can be read under the pointer on the scale of the instrument.

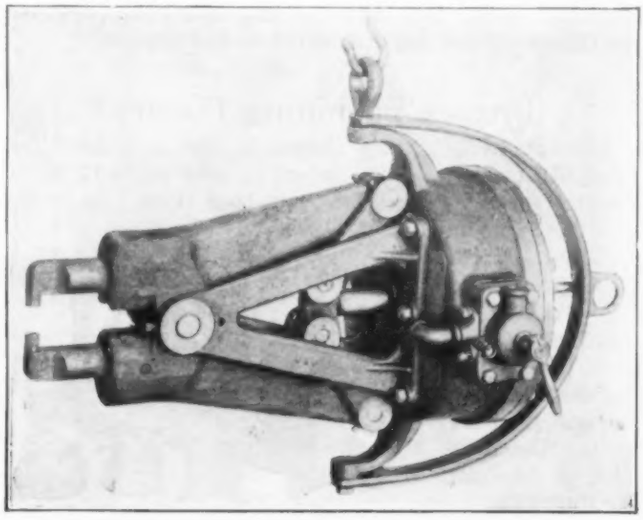
The pyrometer can be furnished in three standard types to cover ranges of 400, 650 or 800 deg. C., the scale of the first mentioned instrument being graduated in 20-deg. intervals and the scales of the others in 25-deg. intervals. A stand with a clamp can be furnished.

Baird Close-Corner Riveter

The Baird Pneumatic Tool Co., Kansas City, Mo., has added to its line the riveter illustrated herewith.

This riveter is a special machine and, as its name implies, is intended for work in extremely close corners where riveting by a hand hammer is impossible.

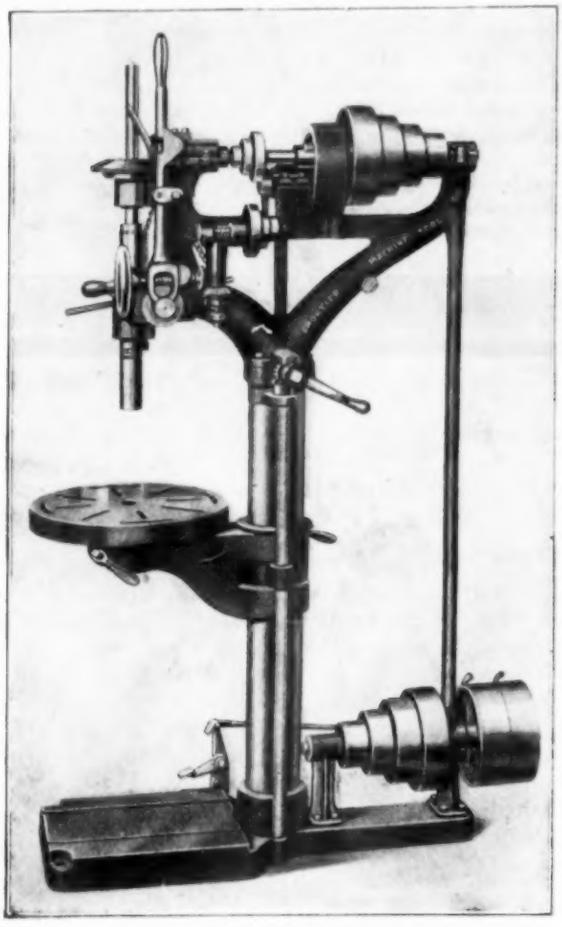
It is claimed that in this riveter, a pressure of 50 tons is exerted on the dies and that ⅞-in. rivets can be driven cold.



BAIRD CLOSE-CORNER RIVETER

Frontier 20-In. Drilling Machine

The 20-in. drilling machine illustrated is manufactured by the Frontier Machine Tool Co., Inc., 128 Lakeview Ave., Buffalo, N. Y., and is designated as



FRONTIER 20-IN. DRILLING MACHINE

Specifications: Table diameter, 17 in. Capacity, up to 1¼ in. drill. Distance between table and spindle, 26 in. Distance between spindle and base, 38½ in. Vertical travel of table on column, 24 in. Hole in spindle, No. 3 Morse taper. Number of speeds, 8, with use of back gear. Feeds; 0.005, 0.015, and 0.030 in per revolution. Floor space 15 x 48 in. Weight; net, 635 lb.; crated, 700 lb.; boxed for export, 950 pounds.

No. 5. An important feature is the double column. The rear column is intended to counteract the effect on the column of the upward thrust on the spindle.

Bremer Babbitting Fixture

The babbitting fixture shown in Fig. 1 is used for rebabbitting bearings of connecting rods up to 12 in. in length, center to center, and any bore from ½ to 2½ in. It is being manufactured by the O. A. Bremer Co., 222 Division St., Burlington, Ia., and is intended for the use of the garage repair shop. The wrist-pin of the connecting rod is clamped in the V-slot at one end of the base and the rod supported in the center so that it is parallel with the base of the fixture, to which the arbor is clamped. The bearings may be babbitted while in the rod or made removable. The claim is made that very little scraping is required to make a perfect fit on the crankshaft. This fixture is supplied with four wooden arbors, 1¼, 1½, 1¾ and 2 in. Its shipping weight is 15 pounds.

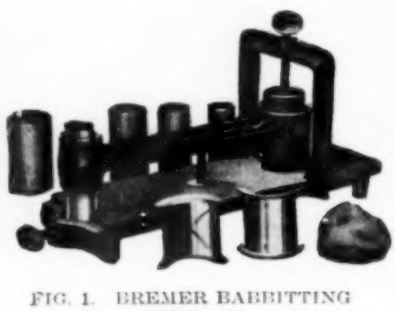


FIG. 1. BREMER BABBITTING FIXTURE

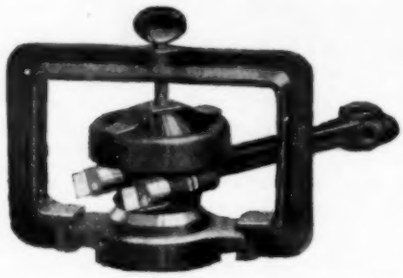
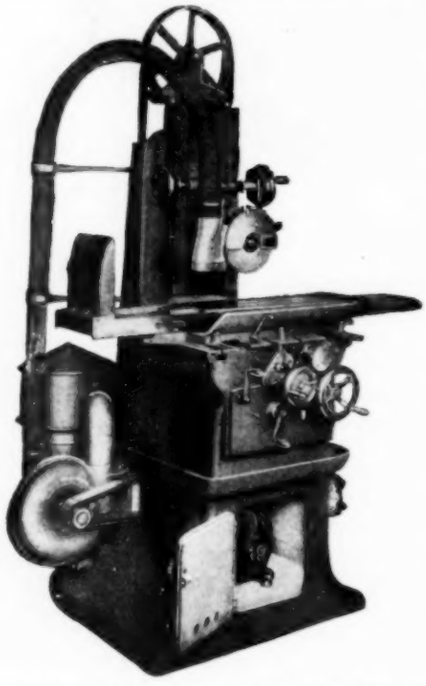


FIG. 2. BABBITTING FIXTURE FOR FORD CONNECTING RODS

The same concern has brought out the fixture shown in Fig. 2 for rebabbitting Ford connecting rods. This device is equipped with a special metal arbor which is machined to the one-thousandth part of an inch. It is said that with the use of this device it is possible to cast the bearings to the exact size and shape without any scraping, with the exception of a few strokes of a coarse file to remove sharp corners. Weight, 8 pounds.

Exhauster Attachment for Surface Grinding Machines

The Abrasive Machine Tool Co., of East Providence, R. I., has designed a complete exhaust system for its machines, as shown in the illustration. The exhauster is equipped with S-K-F ball bearings and aluminum fan, running at 4,000 r.p.m. It is connected with the aluminum dust collector on the wheel hood by means of a large flexible wire-insert rubber suction tubing. The wheel dust is drawn in through the flexible tubing, and forced into the centrifugal drum attached to the rear of the machine, where the dust is separated and deposited at the bottom of the cone. The accumulation of dust can be easily removed by unscrewing a cap at the bottom of the separator drum, which should be attended to each morning. Although designed primarily for single machines not placed in a battery where a central exhaust system can be employed, the claim is made that this exhauster is more economical in many cases than the central system because it is not running when the machine is idle.



THE EXHAUSTER ATTACHMENT

The Hardening of Screw Gages With the Least Distortion in Pitch*

By WILFRID J. LINEHAM†
Goldsmiths College, London

The first paper was complete in itself. A quenching temperature of 700 deg. C. (1,292 deg. F.) was indicated as the position of smallest stable distortion in length under the conditions carefully stated. There were six sets of experiments (Experiments 1 to 6) and the time of casing in cyanide was about half-an-hour, calculated to produce a case of about 0.003 inch. It should be noted that the experiments did not actually prove more than was claimed in the paper, and nothing was made evident regarding any other possible conditions. Continuing his experiments, the author subsequently found other important results, which are now described in this second paper.

(Part I was published last week)

II. Oil Hardening

AN ACTUAL screw-gage was prepared to the dimensions in Fig. 15A. This was screwed in the lathe to 0.0002 in. minus in total pitches and to the diameters shown in the chart, Fig. 16. It was cased in barium carbonate and bone black for two hours at a temperature estimated at 800 to 850 deg. C. (1,472 to 1,562 deg. F.). It was immediately afterward transferred to the cyanide bath, which stood at 770 deg. C. (1,418 deg. F.), allowed a quarter hour to even up, and another quarter to lower to 695 deg. C. (1,283 deg. F.), at which temperature it was quenched in water at about 15 deg. C. (59 deg. F.).

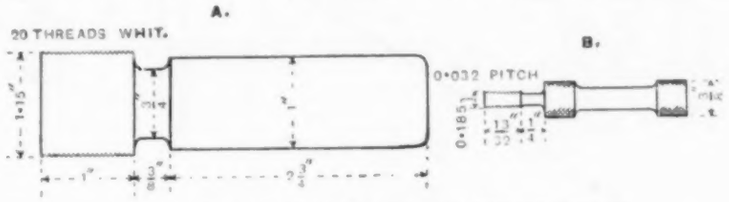


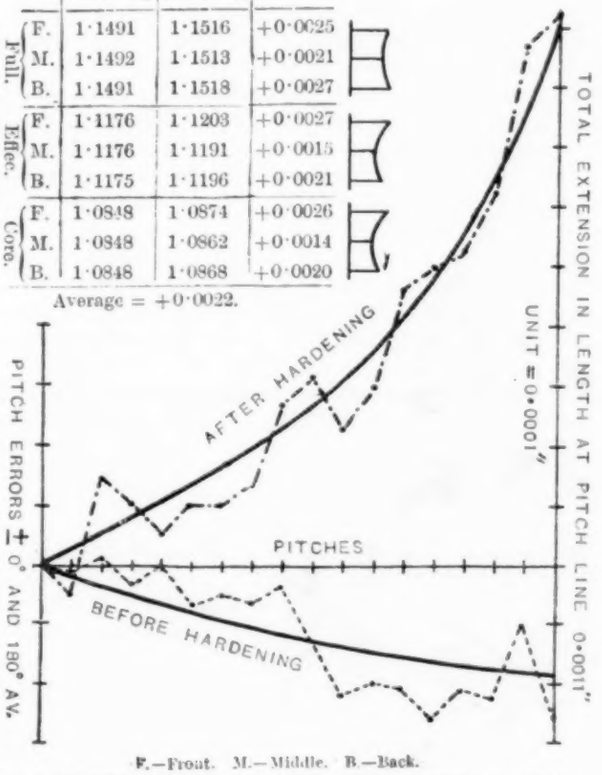
FIG. 15. GAGES USED IN EXPERIMENTS
A for Figs. 16 to 19, 24, 24A, 25 and 25A. *B* for Figs. 26 to 29.

The results of this test are shown in Fig. 16, from which it will be seen that the length increased to 0.0011 in., while the diameters were enlarged by about 0.0022 in., the festoon shape being definitely formed on the rim. It is evident that the extension of 0.0002 in. found in the previous paper is only correct for gages cased for half-an-hour in cyanide and does not apply to the treatment under present consideration. [This experiment took place May 22, 1918, and was labeled No. 7.]

*Read at a meeting of the Institution of Mechanical Engineers.
†Deceased.

Diameters.		Before Hardening.	After Hardening.	Change.
Full.	F.	1·1491	1·1516	+0·0025
	M.	1·1492	1·1513	+0·0021
	B.	1·1491	1·1518	+0·0027
Effec.	F.	1·1176	1·1203	+0·0027
	M.	1·1176	1·1191	+0·0015
	B.	1·1175	1·1196	+0·0021
Core.	F.	1·0848	1·0874	+0·0026
	M.	1·0848	1·0862	+0·0014
	B.	1·0848	1·0868	+0·0020

Average = +0·0022.



F.—Front. M.—Middle. B.—Back.

FIG. 16. EXPERIMENT 7. CASED FOR 2 HOURS IN BOX. HARDENED IN WATER FROM 695 DEG. C.

Diameters.		Before Hardening.	After Hardening.	Change.
Full.	F.	1·1490	1·1515	+0·0025
	M.	1·1490	1·1501	+0·0011
	B.	1·1490	1·1507	+0·0017
Effec.	F.	1·1181	1·1207	+0·0026
	M.	1·1182	1·1195	+0·0013
	B.	1·1182	1·1200	+0·0018
Core.	F.	1·0848	1·0869	+0·0021
	M.	1·0849	1·0855	+0·0006
	B.	1·0849	1·0859	+0·0010

Average = +0·0016.

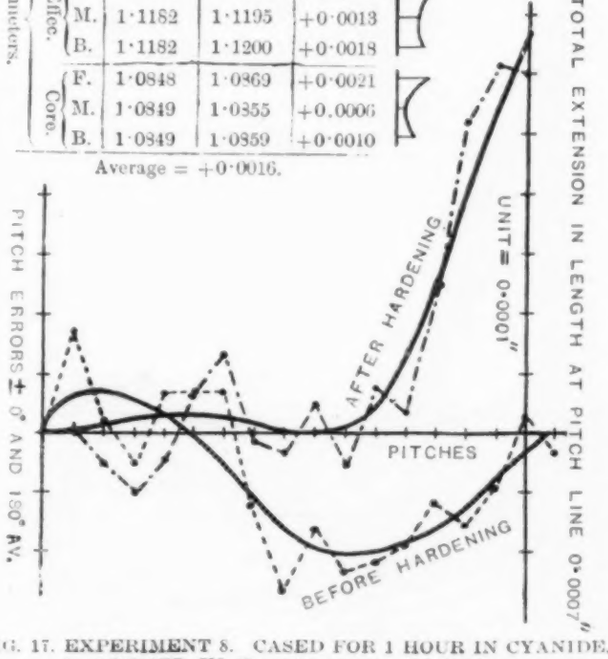


FIG. 17. EXPERIMENT 8. CASED FOR 1 HOUR IN CYANIDE. HARDENED IN WATER FROM 695 DEG. C.

		Before Hardening.	After Hardening.	Change.
Diameters. Full.	F.	1·1489	1·1511	+0·0022
	M.	1·1489	1·1511	+0·0022
	B.	1·1490	1·1510	+0·0020
Effec.	F.	1·1170	1·1190	+0·0020
	M.	1·1170	1·1184	+0·0014
	B.	1·1172	1·1192	+0·0020
Core.	F.	1·0861	1·0877	+0·0016
	M.	1·0855	1·0872	+0·0017
	B	1·0858	1·0872	+0·0014

Average = +0·0017.

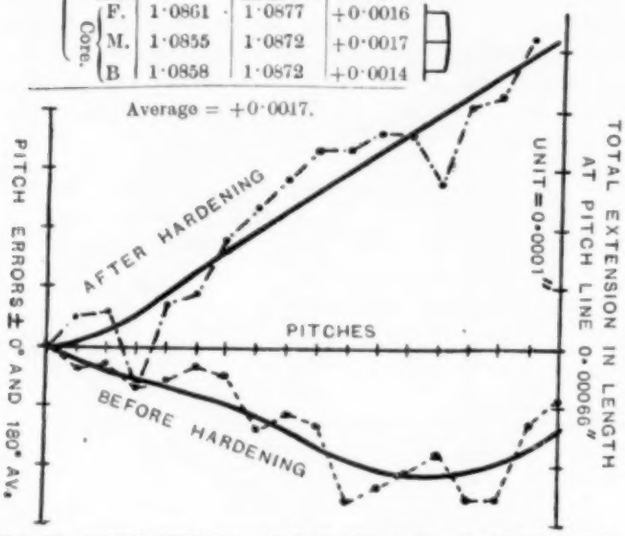


FIG. 18. EXPERIMENT 9. CASED FOR 1 HOUR IN CYANIDE, HARDENED IN WATER FROM 695 DEG. C.

Experiment 8 (May 24, 1918).—A similar screw-gage was heated for one hour in cyanide and afterward quenched at 695 deg. C. in *water* (Fig. 17). The extension is now 0.0007 in., and the increase in diameter about 0.0016 in. It should be noted that the gage has a long screw and the experiment rather suggests that length is a factor in total extension.

		Before Hardening.	After Hardening.	Change.
Diameters. Full.	F.	1·1491	1·1492	+0·0001
	M.	1·1491	1·1492	+0·0001
	B.	1·1491	1·1492	+0·0001
Effec.	F.	1·1172	1·1173	+0·0001
	M.	1·1175	1·1173	−0·0002
	B.	1·1172	1·1173	+0·0001
Core.	F.	1·0847	1·0845	−0·0002
	M.	1·0844	1·0845	+0·0001
	B.	1·0845	1·0844	−0·0001

Average = 0.

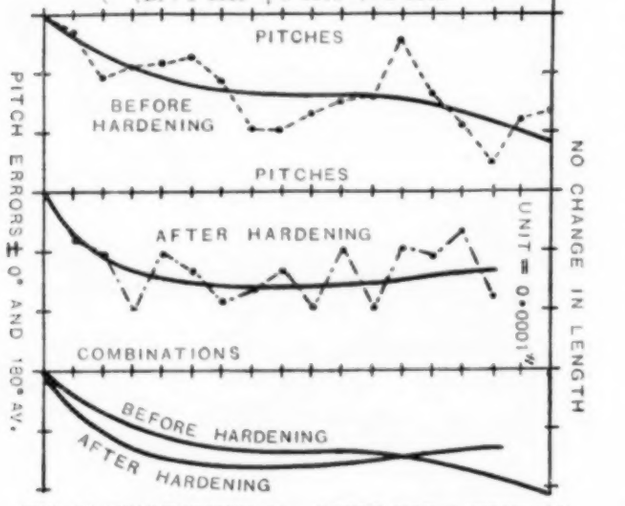


FIG. 19. EXPERIMENT 10. CASED FOR 1 HOUR IN CYANIDE HARDENED IN OIL FROM 695 DEG. C.

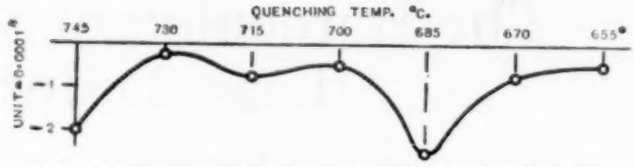


FIG. 20. EXPERIMENT 11. HEATED FOR 1 HOUR IN CYANIDE AT 770 DEG. C. AND QUENCHED FROM TEMPERATURES GIVEN IN OIL AT 22 TO 29 DEG. C.

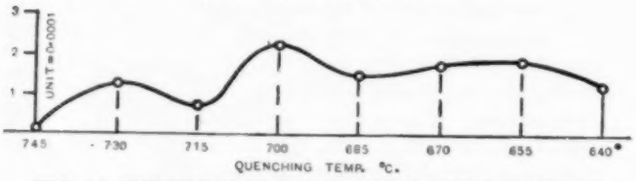


FIG. 21. EXPERIMENT 12. HEATED FOR 1 HOUR IN CYANIDE AT 770 DEG. C. AND QUENCHED IN OIL FROM TEMPERATURES GIVEN

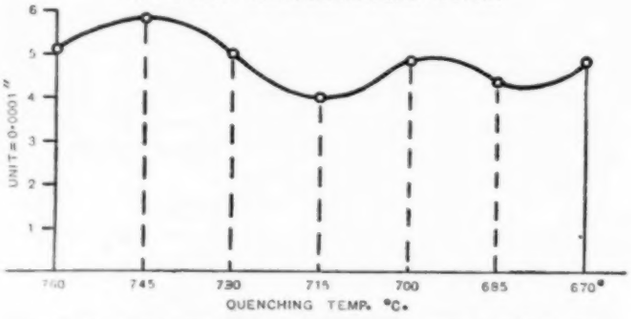


FIG. 22. EXPERIMENT 13. HEATED FOR 1 HOUR IN CYANIDE AT 770 DEG. C. AND QUENCHED IN OIL FROM TEMPERATURES GIVEN, OIL AT 20 DEG. C.

Experiment 9 (May 24, 1918).—This gage is another repetition of that in Fig. 15A and the results of cyanide casing for one hour with a quenching from 695 deg. C. in *water* are given in Fig. 18. The extension in length, 0.00066 in. is only a trifle better than the last gage: while the diameter change, averaging 0.0017, is about the same, but it is much more variable. The general result of Experiments 8 and 9 is to suggest a stable extension of 0.0007 in. under the exact conditions given.

Experiment 10 (May 25, 1918).—The same form of gage, after heating, was cooled in *cold machine oil*, and the chart in Fig. 19 shows an essentially unaltered condition on all dimensions. The quenching temperature was 700 deg. C. (1,292 deg. F.). The use of oil as a quenching medium was entirely due to the initiative of E. W. Eager, and the result is indeed remark-

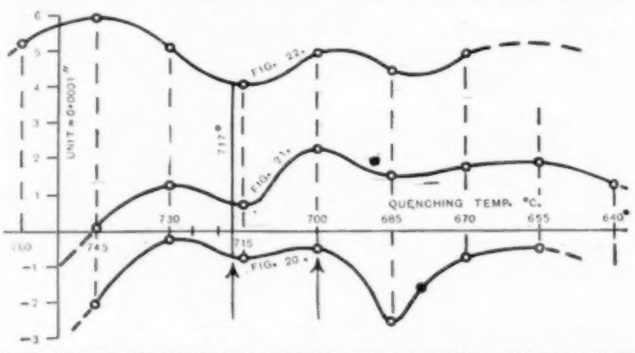


FIG. 23. COMPARISON OF THE DISTORTION CURVES. THE CURVES SHOW CHANGES IN LENGTH ONLY

able. The hardness was tested with a new file, and no kind of scratch was obtainable. The author's attempts to eliminate lapping seemed reasonably in sight, and it was decided to attack the subject afresh by the use of specimens as in the first paper.

Experiment 11 (May 27, 1918).—Seven cylindrical specimens were provided, each about $\frac{3}{16}$ in. in diameter

			Before Hardening	After Hardening	After Lapping
Dia.	Full.	F.	1.1495	1.1500	1.1494
		M.	1.1498	1.1504	1.1494
		B.	1.1498	1.1504	1.1494
	Effec.	F.	1.1171	1.1180	1.1174
		M.	1.1170	1.1177	1.1174
		B.	1.1170	1.1179	1.1174
	Core.	F.	1.0862	1.0864	1.0858
		M.	1.0861	1.0864	1.0858
		B.	1.0862	1.0864	1.0857

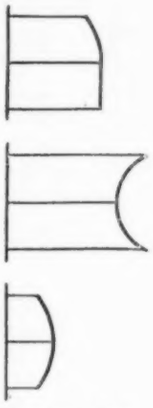


FIG. 24. DIAMETRAL DISTORTION: APPLICATIONS OF THE HARDENING LAW FOR OIL. 1 HOUR CASED. QUENCHED AT 717 DEG. C. (1,323 DEG. F.)

and 0.7 in. long, of J and L steel, 0.14 per cent carbon. They were heated in cyanide for one hour, and quenched from the temperatures given in Fig. 20 in oil at from 22 to 29 deg. C. (72 to 84 deg. F.). The mode of measurement was as described in the first paper, and the distortions were taken on length only. The hardness in this and the following experiments was excellent. In every case there is a decrease in length, but

			Before Hardening	After Hardening	After Lapping
Dia.	Full.	F.	1.1492	1.1499	1.1495
		M.	1.1494	1.1499	1.1495
		B.	1.1495	1.1500	1.1494
	Effec.	F.	1.1178	1.1173	1.1175
		M.	1.1177	1.1173	1.1174
		B.	1.1178	1.1172	1.1172
	Core.	F.	1.0853	1.0856	1.0853
		M.	1.0853	1.0856	1.0853
		B.	1.0855	1.0856	1.0851

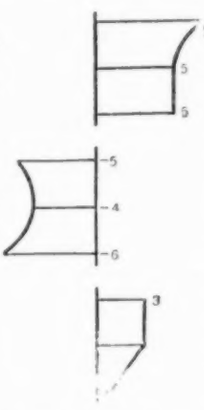


FIG. 25. DIAMETRAL DISTORTION. FURTHER APPLICATIONS OF THE HARDENING LAW FOR OIL

the amount is generally very small. The best temperatures are between 700 and 730 deg. C. (1,292 and 1,346 deg. F.).

Experiment 12 (May 28, 1918).—The distortions are all extensions, Fig. 21, and their amounts somewhat larger on the whole, though not really great. No good law is yet apparent.

Experiment 13 (June 5, 1918).—The distortions are again plus, Fig. 22, but they are much larger than in the two previous cases. This the author believed to be entirely due to the fact that the material was unannealed beforehand, while in Experiments 11 and 12 the material was annealed. It is found that with annealed gages the first two experiments can be repeated nearly

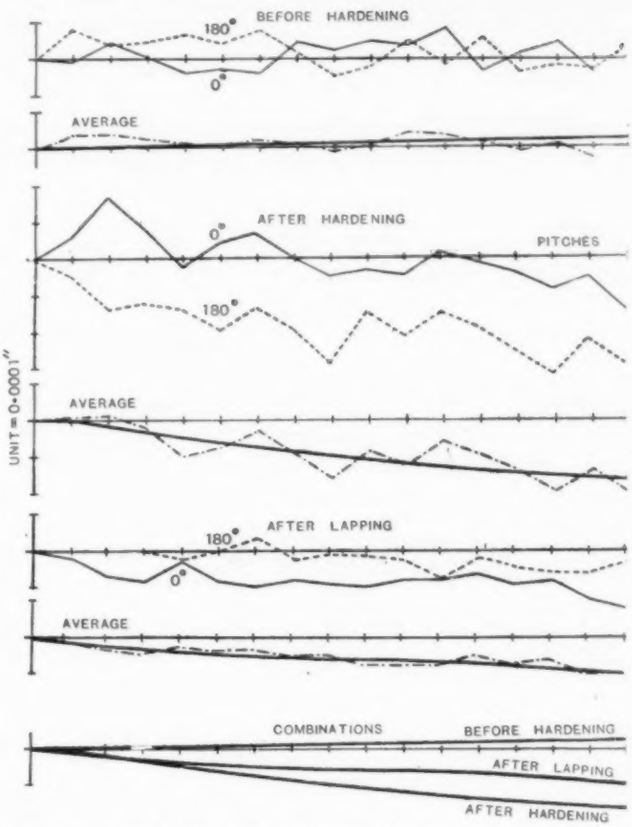


FIG. 24a. APPLICATIONS OF THE HARDENING LAW FOR OIL. 1 HOUR CASED. QUENCHED AT 717 DEG. C. CURVES OF PITCH ERROR

every time, and Experiment 13 may be viewed as abnormal although it has a certain value in the way of comparison, as follows:

In Fig. 23 the three curves are compared on a common base. No crossing law can be found as in the first paper, but a curious "stream-line" effect is noticeable, and a minimum or dip in the curves at the temperature of 717 deg. C. (1,323 deg. F.). This temperature is therefore indicated as that of least distortion on quenching and is that which the author definitely adopted in screw-gage manufacture.

Applications of the hardening law for oil are next given in Figs. 24 to 29. The charts, Figs. 24 and 25, and diagrams, 24A and 25A, show at a glance the results of the application of the quenching temperature of 717 deg. C. Both the diametral and pitch distortions can be seen from this chart.

In Fig. 24, the respective gage in Fig. 15A was screwed without serious error and was reduced in total length by hardening to the extent of 0.0001 in. As the diameters had been turned a little large, lapping had to be used, but the effect was good, and the final gage was only about 0.00005 in. short.

In Fig. 25A the three curves at bottom of diagram show only small changes due to hardening and lapping. The most serious change is that due to lapping, which has caused a difference between the readings at 0 and 180 deg. of the gage circumference. This clearly indicates that a small thickness of surface removed may warp a gage, just as a shaving taken off timber will do, by releasing internal stress.

The remaining diagrams, Figs. 26 to 29, which show the final combinations only for the smaller gage, Fig. 15B, each exhibit distinctive features worthy of study.

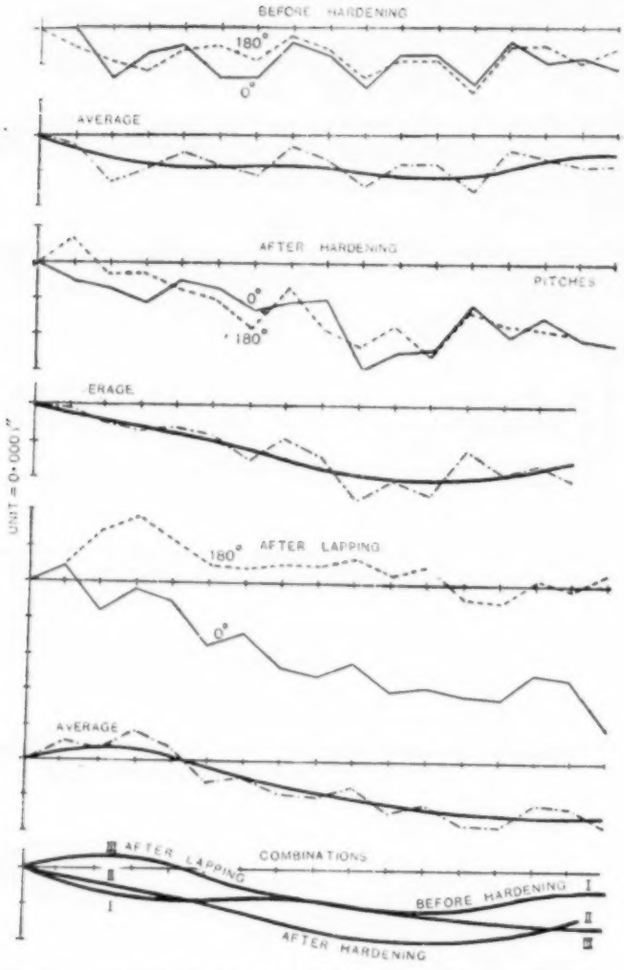
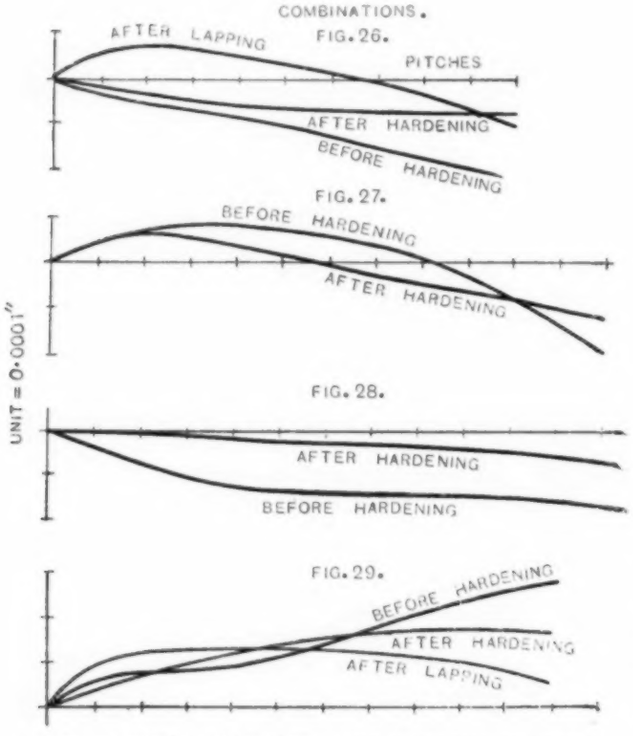


FIG. 25a. FURTHER APPLICATIONS OF THE HARDENING LAW FOR OIL. CURVES OF PITCH ERROR



FIGS. 26 TO 29. FURTHER APPLICATIONS OF THE HARDENING LAW FOR OIL

What is claimed generally is that screw-gages can now be produced, which if screwed to correct pitch, in a lathe having a correcting bar, and to diameters which are two-thirds of the limit below high and one-third above low, and hardened by quenching from 717 deg. C. in oil, will not need to be lapped at all, but merely polished with a little rouge or other fine powder. The advantage is a great saving in time and cost, both important in wartime, for two-thirds of the cost of a gage often lies in the lapping. Even if lapping has to take place it need not be more than the very smallest amount, but the great majority of the gages should not be lapped at all. The best ideal is to try and retain the perfect work that a good lathe produces, for lapping nearly always distorts. The only advantage that lapping possesses lies in its partial elimination of bad periodic errors, but these again can be overcome in the lathe itself.

The conclusions drawn from this paper are:

(1). Hardening screw gages in oil, after casing in cyanide, can be performed with less distortion than if water is the quenching medium.

(2). The temperature of 717 deg. C. (1,323 deg. F.) is the best heat for quenching.

(3). By screwing gages to accurate pitch and to diameters at two-thirds below high limit and one-third above low limit, lapping can be dispensed with.

Co-operation Between Manufacturer and Dealer

BY C. A. HERBERTS
President, Herberts Machinery and Supply Co.

There seems to exist a lack of co-operation between the machine-tool manufacturer and the dealer. Machine tools as a whole are a line which is by no means easy to understand, but instead one in which the best of engineers are engaged, everlastingly re-designing and making improvements which will increase production. These are some of the problems of the manufacturer, who, however, has little to worry about in placing his line upon the market, since he sells his product to the dealer who pays promptly and carries from his commission the real selling and financial burden.

The machine-tool dealer should give considerable study and thought to his line because it is a business about which many things must be understood, e.g., which machine is best adapted to do certain classes of work; the most accurate method of producing the parts; and the most simple methods to secure the greatest production, which is essential on account of the scarcity of skilled labor as well as the high wages in existence. Therefore, it is essential that the machine-tool dealer must understand his business to meet with real success with the trade as well as for himself.

One of the most important points which some dealers at times overlook is the fact that the salesmen in their employ are not thoroughly practical men and that these men are in constant contact with men who are practical, who understand the correct use of machine tools and who know what they will and will not do. The average machine-shop foreman and superintendent, upon whom the "catalog" salesman calls, laugh up their sleeves after he leaves, on account of the breaks he made in good faith while trying to impress his prospective customer with the tool he was trying to sell.

The machine-tool manufacturer should be very careful in whose hands he places an agency. It is not necessarily the largest machinery dealer who gives the best representation; it is the dealer who makes a study of his own lines, knows them thoroughly, can operate the various machine tools and make recommendations as to set-up and jigging methods, spindle speeds, and feeds. A concern buying equipment loves to talk shop to a fellow next to his job and one who makes a suggestion once in a while that means dollars and cents instead of giving the reply: "I do not know; I'll look it up or write the factory."

The manufacturer of machine tools should know with whom he is doing business, and should give the following points serious consideration when securing a new agent:

1. What success has the dealer had?
2. What progress has he made?
3. Does the trade in his territory approve of his business methods?
4. Does he play the game fair with his trade?
5. Does he make the proper adjustment whenever necessary?
6. Does he extend too much credit, thereby jeopardizing himself and doing an injustice to his creditors, who are machine-tool builders?
7. Will he carry in stock a sufficient number of machine tools to make a just showing as well as to keep him in a position to make fairly prompt deliveries?
8. Will he pay his bills promptly?
9. What type of salesman does he employ?
10. Is he a live-wire, who does things, or perhaps a half-way-between, or else a has-been?
11. Can he be depended upon?

If some of you machine-tool manufacturers will give the above points more consideration in the future than you have in the past, you, no doubt, will be better off. Should present conditions become reversed and your production be greater than the demand, kindly remember that some day—it may be a matter of from three to five years, yes, perhaps ten—a reverse is bound to come, and then when money tightens up, sales drop off, credits are extended, money from dealers comes in more slowly, prices due to these conditions adjust themselves and profits are lower, and above all you endeavor to keep your plant running full force, it is then you will need a real live-wire, enterprising, full-of-pep concern to represent you, to assist in keeping up production in quantity, thereby lowering the cost of manufacturing—in other words keeping down your overhead.

Now then, I have said enough to you machine-tool manufacturers in the way of suggestion and advice, and I am sure you are going to do as you please about it, no matter what my ideas may be; therefore, allow me to look at the manufacturer from a dealer's standpoint, and endeavor to enumerate the qualifications we should require as machine-tool dealers:

1. That the concern we represent manufacture a high-grade article, one that can be depended upon.
2. That you keep up with the times, making improvements, not by copying after your competitor has already made them, but by setting the pace and keeping it up.
3. That you do not quote misleading delivery dates, falling down continually, and having dealers make enemies out of friends and customers, due to your misrepresentations.
4. That you answer telegrams and letters promptly, and be careful about what you say—don't let the office boy do it.
5. That when shipping machine tools you be careful in crating them securely and slushing them well, because it is a nasty job putting through claims with the railroad, and a nastier job collecting them. Moreover the tool which arrives all broken up may have been previously sold, and its condition cause cancellation of the order and secure the ill will of the customer.
6. That you give each dealer a square deal; not giving one concern the greater part of your products, half of which may be for stock purposes, and failing to furnish machines to another who has them actually sold, with customers continually pounding him for delivery.
7. That, whenever possible, you ship machinery intact, because few dealers are operating factory branch assembly departments where they can spare help to do this work, and where they do have such departments they are not so competent as you in making adjustments, etc.
8. That you have pity on your poor dealer; remember that he is in the middle, catching it from both sides, the customer and the manufacturer, and must fight all battles to a conclusion satisfactory to both concerned. This, I assure you, is a mighty hard job, because each machine-tool manufacturer believes that he is almost infallible and that so poor a job as outlined by his dealer is impossible and could not have slipped by his inspector, saying "we do not turn out that class of goods."
9. That you, therefore, give your dealer credit for common horsesense.
10. That you remember when you sell a machine or quantity of machines to a dealer, that you take practically no financial risk whatsoever, because you, in most cases, have had years of business dealings with him and know his pocketbook almost as well as your own, whereas the dealer is taking chances every day by extending credits on open accounts to concerns who may be good, but slow pay, and by selling others upon lease contracts, which cause him to wait months for his money, and in some cases much work and worry to secure these payments.
11. That you CO-OPERATE!

It might interest you to learn that the writer established this concern just five years ago. Our first store was nothing but a small hole in the wall, size about 10 x 20 ft. We were obliged to move into larger quarters five times during the five years we were in business in Los Angeles, and now occupy a large two-story building, which has a floor space of 12,300 sq.ft., corner 3rd and San Pedro Sts., in the heart of the machinery district, with modern display floor, crane, and railroad siding.

Our San Francisco branch was opened about a year ago, at 168 Second St., and we must admit that our growth in that city has been so rapid that we were compelled to build, and are now erecting a two-story-and-basement building at a cost of approximately $75,000 at the corner of First and Minna Sts., having about 13,500 sq.ft. of floor space, which we hope to occupy within a month.

Perhaps our growth is in part the result of the policies outlined above together with the fact that one must keep everlastingly after whatever he may undertake, accept knocks with a smile, and do things, not becoming discouraged when an order is lost, because no one can secure them all. Remember, the other fellow has to live, too. However, making up your own mind to secure a certain order is half of the battle.

Norton 10-inch "B" Type Grinding Machine

Improvements in machine design are generally comparatively slow developments, a little here and a little there. But we expect an occasional big step to add to the excitement of the dull season When a grinding machine manufacturer announces a grinding speed 200 per cent faster than anything he has attained before we are inclined to think that a big step has been taken. There are other improvements here worth studying.

THE Norton Co., Worcester, Mass., has recently completed and put on the market a grinding machine which embodies some novel features.

Heretofore the speed of table traverse in this class of machinery has been limited to 10 or 12 ft. per minute; principally because of the necessity for instant and accurate reversal of direction at the predetermined point. This reversal has hitherto been accomplished through the medium of positive clutches with hardened contact jaws, and at the expense of severe strains imposed upon the table driving mechanism.

To obviate this strain, even though the table speed

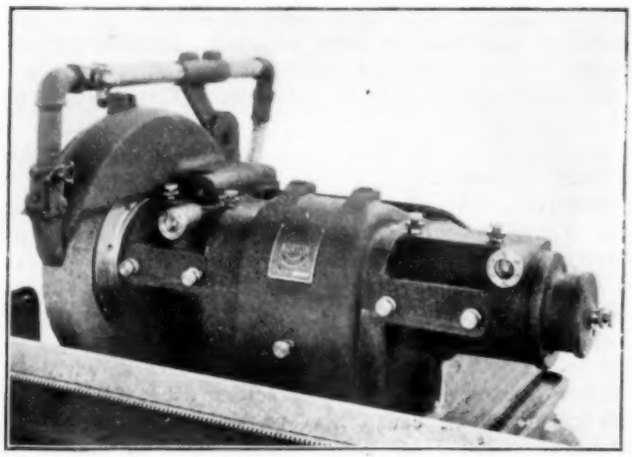


FIG. 1. THE WHEEL SPINDLE AND BEARING

be increased from 200 to 300 per cent over the older type, as well as to eliminate the disagreeable jar and noise incident to the reversal, an entirely new principle has been introduced.

The table is driven by rack and gear in the usual manner, and the drive is through a worm and wheel; but the worm, instead of being keyed to the clutch shaft merely floats upon it so that the shaft is free to revolve within it and the worm is free to move endwise on the shaft, within certain limits.

Rigdly attached to each end of the worm is a face-cam the rise of which has been plotted to a gravity curve. Keyed to the clutch shaft at a distance apart that allows the worm and its attached cams a free end movement of about 3 in. on the shaft, are two spiders, each carrying a ball-bearing roller. Rises of the two cams are opposed to each other.

The action at the instant of reversal is as follows: When the clutch shaft stops its rotative movement and begins to turn in the opposite direction (this reversal is by positive clutch, operated by the table dogs) the worm does not immediately begin to revolve. Instead, the roller on the spider rides up the curve of its cam, pushing the cam and worm endwise along the clutch shaft until this movement is stopped by the spider at the opposite end.

This endwise movement of the worm of course starts the table on its return, but the latter, instead of being started instantly at full speed, is started from zero speed, accelerating by the gravity curve of the cam, until the limit of endwise movement of the worm is reached; at which time the table is travelling at full speed and at this same moment the worm begins to revolve, carrying the table to the end of its stroke, where the cycle is repeated in the reverse direction.

With a table speed of 36 ft. per minute, three times that of the fastest speed hitherto attempted, the reversal is accomplished without perceptible jar and with so little noise that the car can hardly detect the moment at which it takes place. The endwise movement of the worm and cams is stopped by oil dash-pots between the hubs of cam and spider.

The main spindle of the machine runs in bronze half-boxes, set at an angle to take the thrust of the work and the pull of the belt. Quarter boxes of babbitt metal, adjustable only by thumbscrews, are provided at the top and front of each bearing; these quarter boxes serving only to prevent vibration of the spindle.

The wheel slide is shown in Fig. 1, where the top and front adjusting screws may be seen; also the adjusting screw for limiting end movement of the spindle. This screw bears upon the outer member of a ball-bearing thrust collar. Adjustment may be made with the machine running, and as there is no way to use a wrench it is impossible to stall the spindle.

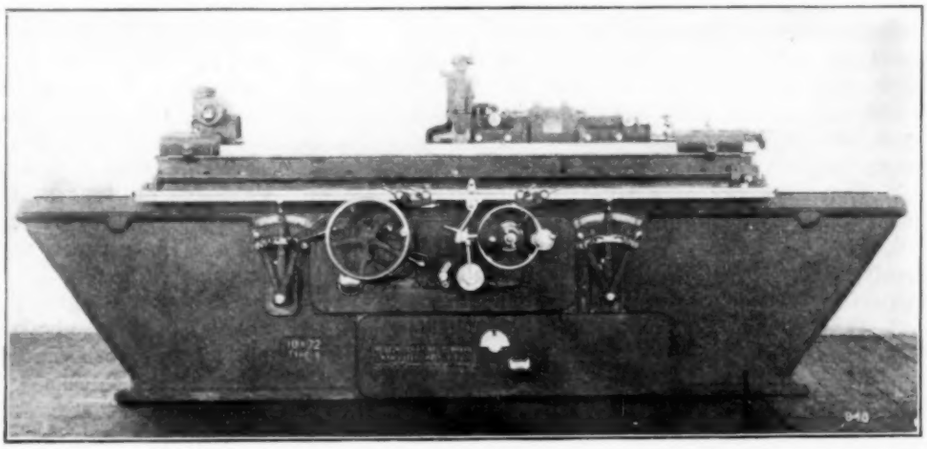


FIG. 2. FRONT VIEW OF MACHINE READY FOR BUSINESS

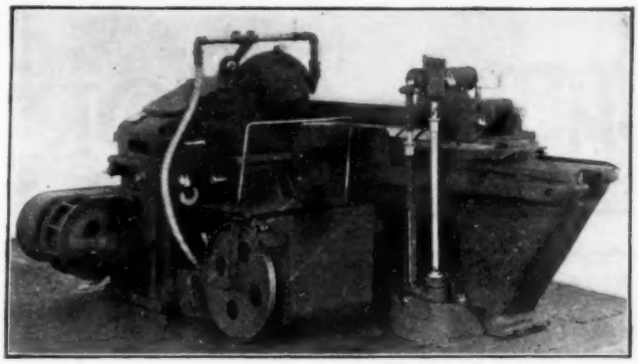


FIG. 3. PERSPECTIVE REAR VIEW OF MACHINE

The base of the wheel slide forms an oil chamber from which a pump, located within the chamber and driven by sprocket and chain from the spindle, forces oil to the main and thrust bearings. The bulls eyes upon each bearing furnish ocular evidence that oil is flowing properly, for if at any time the flow should stop these little chambers would instantly be flooded.

Wheels of 2½ in. face and with a large hole in the center are used. The large wheel-spider is recessed to allow the main bearing to project nearly to the center line of the wheel, thus insuring a maximum of rigidity and freedom from vibration. But one spindle speed is provided, and that is calculated for maximum wheel efficiency at a wheel diameter that is half-way between the diameter of a new wheel and that of one that is worn down as far as is safe to go.

Fig. 2 shows the general appearance of the machine. The levers shown at the left control the rotative movement of the headstock and the levers at the right, the table movements. These controls are so designed that when the position of both sets of levers coincide, the relative movements of work and table are such that a 2½-in. wheelface exactly covers the angular advance of the work. The control is through the medium of heat-treated steel change-gears very much like the "transmission" of an automobile. The horizontal lever back of the larger handwheel operates a disk clutch by which the table traverse may be stopped and started at any point; it also operates a clutch that disengages the handwheel, so that the latter is idle while the table is being traversed by power. Raising the lever stops the power movement and automatically brings the handwheel into action.

The "in-and-out" movement of the grinding wheel is by means of the smaller handwheel upon which is the power feed and automatic sizing mechanism. The power feed is adjustable by quarter thousandths, to operate at each reversal of the table, or to feed continuously with the table idle, as for facing a shoulder.

A rear perspective is shown in Fig. 3 displaying the unique method of getting power to the headstock. The latter is driven by helical gears enclosed in an oil-filled chamber. The upright shaft seen near the right end of this view connects directly with helical gear members mounted in swiveling cases so that the shaft is free to swing back and forth at the upper end, following the movement of the table to its extreme in either direction. Though the picture does not make it evident, this shaft is in two parts, one telescoping within the other to compensate for the varying length.

The bar outside the shaft is called the "torsion rod." It connects together the two swiveling gear-cases and has no other office than to relieve the drive shaft of any side strain due to its oscillating motion. It will be noted that there are universal joints in the drive-shaft; these do not, however, come into action as such unless the upper table is swivelled to grind a taper. On parallel work the drive-shaft, whatever its angular position, is always a straight line.

Another unique feature of the machine is the settling basin and tank for the grinding lubricant, seen in place in Fig. 3 and detached in Fig. 4. This is a sheet metal tank mounted on ball-bearing wheels and having a bail or handle for convenience in handling it.

By having one extra tank for a battery of five or six machines, no machine need be put out of business for cleaning out. To roll a clogged tank out of the way and roll into its place another tank filled with fresh clean grinding solution is but the work of seconds. The helper can clean out the clogged tank at his convenience.

The machine is self-contained. The drive is from a 15-hp. motor mounted on the machine. There are no countershafts or overhead works of any kind. The machine as shown in the illustrations is ready for business.

There are but two belts on the machine and these are both completely enclosed. One drives from the motor to the power shaft within the base; the other from the power shaft to the wheel spindle. Six-inch belts are used. All other mechanisms are driven through spur or helical gears running in oil.

All important bearings except those of the wheel spindle are ball bearings, of which there are forty-seven in the machine. For every place on the machine where a wrench is needed the crank wrench shown in place on the headstock in Figs. 2 and 3, is available. The wheel collar is removed with a screwdriver.

The machine swings an 18-in. wheel with a face width of 2½ in., though wheels 6 in. wide may be used. The spindle runs 1,300 r.p.m. The table traverse has six work speeds ranging from 10 to 36 ft. per minute and a separate very slow speed for wheel truing. The headstock has six rotative speeds ranging from 53 to 167 r.p.m.

The floor space required is 16 ft. 3 in. x 7 ft. 2 in. and the extreme height is less than 5 ft. The approximate net weight complete, with motor is 11,000 lb. The machine, as built at present, will swing work up to 10 in. in diameter and will take 72 in. between centers.

FIG. 4. THE DETACHABLE COOLANT TANK AND SETTLING BASIN

SPARKS FROM THE WORK

Valentine Francis

Program of Safety Council Congress Attractive

The program of the Ninth Annual Safety Congress of the National Safety Council, which has already been announced in our "Forthcoming Meetings" column, includes many subjects of interest to the machine-building industry. This congress will be held at the Auditorium, Milwaukee, Wis., from Sept. 27 to Oct. 1. Milwaukee, in co-operation with the congress, has selected this week as its "no accident week."

The congress has been divided into sections and each of these sections will hold its own sessions. There will be automotive, cement, chemical, construction, metals, mining, public utilities, steam railroad, textile, woodworking, engineering sections, and many others. There will also be joint meetings. Round-table discussions, with the object of invoking "pep" into the various meetings, will be held daily. Many nationally prominent men will speak.

Among papers of interest to the machine shop are: The Essentials of a Plant Safety Organization, How to Promote Safety Education in a Plant, Building a Safety Organization in a Foundry, Training Machine Operators in Safe Methods, Safety Features of Overhead Electric Traveling Cranes from the Standpoint of Construction and Design, Safe Practices in Blast-Furnace Operation, the Trade Journal as a Valuable Aid to Safety and Shop Accidents.

There will be plenty of entertainments; smokers, banquets, dances and moving pictures being arranged for. Visitors will be given an opportunity to see all the latest films which have been produced on safety subjects.

Bilton Salesmen's Convention

The Bilton Machine Tool Co. held the second annual convention of its salesmen on Sept. 7, 8 and 9 at its plant in Bridgeport, Conn. The gathering offered the opportunity not only for instructing the salesmen and familiarizing them with the plant which they represent, but also for the staff to become acquainted. The men heard talks from officers and heads of different departments, so that they were put in touch with all phases of the business. One of the principal men outside of the Bilton organization to address the salesmen was Mason Britton, manager of the *American Machinist*, who spoke on the machine-tool industry in Europe and the sales possibilities for American goods over there.

Denver's Open-Shop Declaration

The following open-shop resolution (unanimously reported from the executive committee of the *Denver Civic and Commercial Association* on April 12, 1920) was unanimously adopted by the board of directors of said association at its meeting on Wednesday, April 14, 1920:

RESOLVED: That we believe in freedom of thought, speech, action and contract as guaranteed under the Constitution of our country.

We oppose no man or set of men in the assertion of such rights in LAWFUL WAYS.

We recognize the right of every man to exercise his right of suffrage, his right of religious belief, his right of contract.

We recognize the right of every man to earn a living for himself and his dependents REGARDLESS of his political, religious or labor affiliations.

We recognize the rights of both union and non-union labor and the right of every man to join or refuse to join a union as he pleases.

We recognize the necessity of full discussion between employers and employees of issues that arise between them.

We declare the use of force, violence, blacklist, boycott or lockout as a means of contesting such issues, to be unlawful and contrary to the public welfare.

THEREFORE: We are unalterably IN FAVOR OF THE "OPEN SHOP"—open to both union and non-union men.

Associated Employers of Indianapolis, Inc.

The recent election of officers of the American Railway Tool Foremen's Association resulted in the following selections: President, J. B. Hasty, A. T. & S. Fe R.R., San Bernardino, Cal.; first vice president, G. W. Smith, C. & O. R.R., Huntington, W. Va.; second vice president, Charles Helm, C. M. & St. P. R.R., Milwaukee, Wis.; secretary-treasurer, Richard D. Fletcher, Chicago, Ill.; chairman executive committee, P. Renfrew, Indianapolis.

Method for the Accurate Measurement of the Interior Diameter of Ring Gages

A method for measuring the inside diameter of plain ring gages has been developed by the Bureau of Standards during the past month. The method is a very simple one and employs two steel balls, the sum of whose diameters is slightly larger than the nominal inside diameter of the ring to be measured. The ring is laid on a surface plate and the larger ball placed in the ring; the smaller one then rests against the inside of the ring and on the larger ball. The difference in vertical position between the upper surfaces of the two balls is determined by means of a micrometer attachment. This dimension is easily converted into the vertical distance between the centers of the two balls. The value thus obtained forms one side of a right-angle triangle whose hypotenuse is the line joining the centers of the two balls and whose base it is desired to determine. Knowing the vertical side and the hypotenuse, it is possible to calculate the length of the base, which added to the radii of the two balls gives the inside diameter of the ring. The method permits an accurate determination of the contact pressure and can be, and has already been, used on extremely small holes. A greater accuracy can be obtained by this method than by any other.

Standardization Conference to Act Upon Invoice Form

The Standardization Conference, called by the Standardization Committee of the National Association of Purchasing Agents, at the Congress Hotel, Chicago, on Oct. 10, is to be held the day preceding the opening of the convention of the National Association of Purchasing Agents and will consider the work of the Standardization Committee for the year, with a view to passing finally upon the recommendation to be made to the National Association regarding the Standardized Invoice Form.

It is important that everyone interested in this subject be present at this conference, because after the matter has been acted upon by the National Association it will be difficult to effect changes in the form.

The committee desires to have all suggestions in before the final form is selected. Some trade associations have agreed to have representatives present to discuss certain phases of the form, and apparently the conference will result in something worth while.

LD'S INDUSTRIAL FORGE
News Editor

Labor's Gains of a Decade in Compensation Laws Against Industrial Accidents

With workmen's compensation laws enacted to date in forty-three states and in Alaska, Porto Rico and Hawaii, in addition to the model measure adopted by the federal government for its half-million civilian employees, rapid progress is being made toward providing industrial accident insurance at cost through state funds, according to a statement issued today by the American Association for Labor Legislation.

"Now that Georgia has at last enacted a workmen's compensation law," the statement says, "there remain only five states, and these non-industrial states in the South, without social insurance protection against industrial accidents. This means that more than five-sixths of the map of the United States has been covered by compensation laws within ten years. There has been a marked tendency in nearly all states to strengthen the laws in the direction of more liberal benefits, shorter waiting periods before payment begins and wider scope.

"Sixteen states and Porto Rico have established state funds for insuring at cost the liability of employers, and in seven of these states the funds are exclusive, eliminating expensive commercial insurance competition. Recent official investigations in Pennsylvania, Ohio and New York disclosed that, compared with the stock casualty companies, the state funds result in savings of millions of dollars every year to industry while at the same time permitting more certain and liberal benefits to injured workmen and their families. It is significant that Ohio's exclusive state fund, which has the united support of employers and employees, is shown to give the best results to both labor and industry."

"Recent reports from all parts of the country," the statement continues, "indicate that along with the development of social insurance against accidents there is a widespread movement for the extension of social insurance laws to protect workers also against the hazard of sickness and the menace of unemployment."

The *Wall Street Journal* states that world-wide revival of manufacturing activity is reflected in increase in exports of lubricating oil from the United States in the last two years. In the year ending June 30, 1920, exports totaled 338,801,130 gal., and in the previous year 273,148,540 gal., compared with 196,884,700 gal. in 1914.

James Hartness Republican Candidate for Governor of Vermont

The many friends of James Hartness will join us in congratulating the State of Vermont in securing such a man as a candidate for Governor on the Republican ticket. Mr. Hartness was opposed by three other candidates, two of them party machine men, and it is a striking tribute, both to his personality and to

JAMES HARTNESS

the good sense of the electorate of Vermont, that Mr. Hartness won hands down.

Running on what was called an Industrial platform, Mr. Hartness pointed out both the needs and the possibility of developing the industries of Vermont. His own achievements in that line were shining examples which evidently appealed to the people more than the platitudes and empty promises of the average candidate.

The country needs sane and forward looking executives as never before. And it is particularly gratifying and hopeful to find the voters selecting a man with broad engineering and business experience for such an office. The best wishes of the whole machine-building industry go with him.

Dates for the national automobile shows in 1921 have been selected as follows by the National Automobile Chamber of Commerce: Jan. 8 to 15, at Grand Central Palace, New York; Jan. 29 to Feb. 4, at the Coliseum, Chicago.

Improvement in General Business Conditions

The *Commercial Monthly* for September, published by the National Bank of Commerce of New York has this to say about business conditions in the United States:

Although superficially not much change is evident in the general business situation from that of July 15, nevertheless underlying intrinsic conditions are slowly and steadily making for a sounder situation. An important element is the determination of business interests to carry into effect a new policy of conducting their affairs on sane and conservative lines, looking toward stability and continuance in business rather than to the policy which until recently prevailed of doing as much business as possible at high prices on a basis of excited public buying with resultant abnormal profits.

Wholesale Commodity Market

With few exceptions, the wholesale markets are now in a conditon of inactivity not paralleled since the period of uncertainty which followed the armistice.. Normally this is the dullest season of the year and the condition of stagnation is partially ascribed to that fact. To a far greater extent, however, it is the result of a widespread realization which has at last become general throughout the business commuity, that the present downward price movement is not a temporary tendency but a decline toward a new level applicable to postwar conditions, a level which can be found only by cautious experimentation in the market. It is possible that in some commodities this new level has already been reached.

International Competition

Totals for the foreign trade of the United States for the year ending June 30, 1920 are now available. Exports from the country amounted to $8,111,000,000, and imports were $5,239,000,000. Due allowance must be made for the price increases which took place during the year, and for changes in the method of valuing imports, which tended to reduce reported figures. Nevertheless, these values serve to point out in a general way certain important changes which have taken place in the foreign trade of the country as compared with the abnormal tendencies during the war period.

Exports increased over the total for the fiscal year ending June 30, 1919, by $879,000,000, while the increase in exports in 1919 as compared with 1918 was $1,313,000,000. The increase in

imports is the outstanding feature of the trade of the year, the gain being from $3,096,000,000 for the year ending June 30, 1919, to $5,239,000,000 in the year ending June 30, 1920, a gain of $2,143,000,000 as compared with the preceding year. The gain in imports for 1919 over imports for 1918 was only $150,000,000. The favorable trade balance of the country for the year was $2,872,000,000, a marked decrease from the favorable balance of $4,137,000,000 for the fiscal year ending June 30, 1919.

The changes in the direction and character of the foreign trade of the United States during 1919 were anticipated, and the decline in the favorable trade balance should not be regarded as undesirable. The situation throughout the war period was entirely abnormal and could not continue. Trade relations, to be satisfactory, must be mutual. However, the American producer, whether he be a farmer or a manufacturer, must face the international situation squarely. Despite industrial disorder and difficulties in adjustment to a peace basis, reports from every direction indicate that with the exception of those countries actually in a state of war, agricultural and industrial production is steadily increasing. This means that American business must prepare to meet steadily increasing European competition; first, in European markets, second, in the export markets of other countries, and third, in the domestic market of the United States.

Personals

C. B. COLE has severed his connections with the Union Twist Drill Co., as manager of its Chicago store and will become associated with the W. L. Romaine Machinery Co., Milwaukee, Wis., in the capacity of vice president and sales manager.

MAJOR HILL resigned recently from head of the engineering department of the Pratt & Whitney Co., of Hartford, Conn., which position he held for the last eighteen months. Mr. Hill has not divulged his future plans.

S. JAY TELLER will have charge of the engineering department of the Pratt & Whitney Co., of Hartford, Conn., succeeding Major Hill, who resigned.

Obituary

P. G. PUFFER, purchasing agent of American Tube and Stamping Co., Bridgeport, Conn., died recently, after a brief illness. Mr. Puffer was formerly with the Union Metallic Cartridge Co., of Bridgeport, Conn., and the Baush Co., at Springfield, Mass.

Lamont and Whitham Declare China and Far East To Be Best Market for U. S. Products

Machinery and Railroad Material Greatest Immediate Need—Export Manufacturers Are Urged To Develop Far East Trade—"Go-Get-It Policy" Urged in Relation to Business There

Thomas W. Lamont, of J. P. Morgan & Co., and Paul Page Whitham, American trade commissioner, were the principal speakers at the luncheon conference of the American Manufacturers' Export Association at the Hotel Pennsylvania recently, according to an account appearing in the *New York Commercial*. Few luncheons held by the association have attracted as large a number of manufacturers engaged in export trade. The ballroom was crowded with almost 500 exporters who listened attentively while Mr. Lamont and Mr. Whitham emphasized that China is the best market for American exporters today.

Mr. Lamont dwelt at some length upon the friendly feeling existing in China for America, due largely, he explained, to the large expenditures in China by Americans with the sole object of contributing to the advancement of the Chinese. He amusingly told of his conceptions of the Chinese before and after his recent trip to the Orient. Before, he said, he little understood the vast resources of the Chinese nation and their huge capacity for buying American goods. Now, he went on to say, this is readily understandable and he urged those present to investigate without delay the great trade possibilities in the Far East.

"I never imagined—until I went out there—a region calling for the products of American industry so strongly as China will call in the next twenty years," said Mr. Lamont. "A great system of railways must be built over there, and its inception should not be long delayed. These railways will require a fair share of American steel, of American bridges, American equipment. The country calls for electrical equipment—for all the multitudinous forms of farming implements required in that intensely agricultural land, now cultivated with the crude implements of the long ago. China will demand cotton mill machinery on a great scale, and machine making tools. Then it will require quantities of mining machinery, both for the base and the precious metals. Finally, those 400,000,000 of kindly, honest and highly intelligent people will require, on a prodigious scale, the many domestic appurtenances that American ingenuity has evolved. Don't forget, too, that to keep 400,000,000 people supplied with moving picture shows will be quite a task even for Americans!"

Turning from China, Mr. Lamont presented a brief discussion of Siberia, stressing the great natural resources of that country, and America's ability to supply the equipment for developing these resources. "If ever peace comes to Russia—as come it must some day—then," he said, "Siberia will find itself. And for that day American manufacturers should be prepared. Don't forget, too, that England regards close trade intercourse between America and Siberia as natural and inevitable. England realizes that the United States is particularly well adapted to furnish to Siberia the kind of manufactures that Siberia requires."

Discussing Japan Mr. Lamont said: "Japan would welcome American capital on a large scale to develop her own industries. She has a limited supply of coal and is anxious to develop her water powers on a large scale. She feels sorely the need of building good roads and of constructing new trolley lines. The United States will, as time goes on, be in a position to supply a good part of this demand. You manufacturers can supply much of the machinery and equipment that are needed. Our investment community can furnish much of the capital."

Mr. Whitham described some of his observations and experiences in China and then told of the trade possibilities of that country. He said in part:

"The Chinese are alive to the advantage of modern machinery and means of transportation. They want railways and factories. They desire to open their coal and iron mines and develop their agricultural and material resources. And they are doing these things, too. Technical and in some instances foreign financial assistance is sought. In this respect Americans are preferred above other nations.

"China has a great Northwest, nearly as large as the American West, west of the Mississippi, exclusive of the Pacific Coast, thinly inhabited but of large potential productivity and resources. It awaits the building of the railways as did America's West, so that the young Chinese may go west and grow up with the country.

"Twenty-one thousand miles of railways must be added to the existing 6,500 miles in order to complete the trunk lines only, the backbone of a system. The Chinese must look to America and Europe for capital as the United States depended upon Europe during the great era of railway expansion. It will pay to make investments in this direction. In fact Chinese American trade expansion is dependent on the transportation development of China.

"The Chinese now purchase foreign goods to the extent of about $1.50 per capita. China properly served with railways and other transportation facilities, the ensuing industrial and production development should raise the purchasing power to five dollars per capita within a short time and much more eventually. Approximately an

BOTH COULD USE HOME DISCIPLINE TO ADVANTAGE

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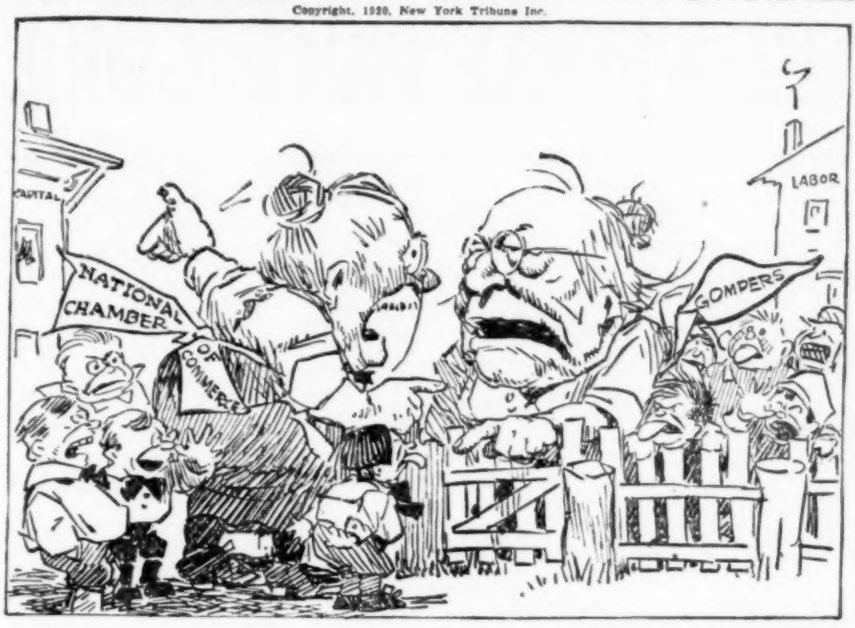


Why not spend a little less time complaining about the behavior of the neighbors' children—

And devote a little more attention to administering some discipline at home?

equal amount would be exported so that the foreign trade of China would then amount to four or five billion dollars a year instead of about one and a half billion as now. It is predicted that many of the Amerian business men will see that day and participate in a Chinese-American trade of at least one billion dollars per year instead of $287,000,000 as in 1919. A go-get-it policy must be pursued, however. The world's greatest future developments will be in Asia and the lands bordering on the Pacific.

"The combined foreign trade of the countries of the Far East alone amounts to about $6,500,000,000 per year. America's share in 1919 was $1,656,000,000. If the needed developments can be financed the total foreign trade of the Far East should rise to at least $12,000,000,000 per year within a reasonably short time and America's share properly should be at least $3,000,000,000 per year, provided American business interests go get it and participate in the transportation and material resource developments.

William L. Saunders, president of the association, presided. This was the first association luncheon held since Arthur W. Willmann assumed the duties of secretary, succeeding Robert F. Valentine. It was pronounced a great success and many members present took occasion following the luncheon to congratulate the new secretary and pledge to him their co-operation.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Merchant in Spain desires to purchase and secure an agency for the sale of twist drills, and machine tools in general. Quotations should be given c.i.f. Spanish port. Correspondence may be in English. References. No. 33,687.

A commercial agency firm in France desires to secure the representation of firms for the sale of iron and steel bars, sheets and tools, and mechanical machinery. References. No. 33,679.

New Publications

Oxy-Acetylene Welding and Cutting. The "Eveready" Instruction Book. Fifty-five 5 x 8-in. pages, 48 illustrations and several tables. Issued by the Oxweld Acetylene Co., Newark, Chicago and Los Angeles.

This is a very good little instruction booklet, and contains information of value to all users of gas torch welding and cutting apparatus. It contains directions for setting up both welding and cutting outfits, how to prepare for a weld, examples of typical welding jobs, instructions for preheating, reheating and annealing, tells about various welding rods, fluxes, how to use the torch, treatment of different steels and metals and deals quite extensively on lead burning. The last is of interest to almost every garage man in the country.

House Wiring. By Thomas W. Poppe. 4th edition, revised and enlarged. 200 pages, 4 x 6, 160 illustrations, flexible cloth binding. Norman W. Henley Pub. Co., 2 West 45th St., New York.

A handy, practical pocket book for the electrician, helper and apprentice. The more advanced electrical worker will at times find it instructive and useful. The book is written in simple language and unexplained technical terms are avoided. In addition to the chapters on ordinary house wiring for lights, etc., there are chapters on burglar alarm wiring, telephone wiring, wiring in concrete construction, direct current motor connections and motor wiring. There are included methods of installing flexible and rigid conduit, diagrams of wiring, switches, etc.

Forthcoming Meetings

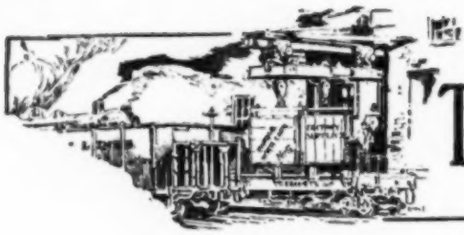
The National Safety Council, 168 North Michigan Ave., Chicago, Ill., will hold its ninth annual safety congress in Milwaukee on Sept. 27 to Oct. 1.

The American Foundrymen's Association will hold its annual convention and exhibit at Columbus, Ohio, on Oct. 4 to 9. C. E. Hoyt, 1401 Harris Trust Building, Chicago, Ill., is secretary.

An exposition of U. S. manufacturers at Buenos Aires, Argentine Republic, S. A., has been arranged for the month beginning Nov. 15. Information can be obtained from the American National Exhibition, Inc., Bush Terminal Sales Building, 132 West 42nd St., New York.

The National Machine Tool Builders' Association will hold its 19th annual Fall convention at the Hotel Astor, New York City, on Thursday and Friday, Dec. 2 and 3, 1920. C. Wood Walter, care of the association at Worcester, Mass., is secretary.

The 1920 annual meeting of the American Society of Mechanical Engineers will be held in the Engineering Societies Building, 29 West 39th Street, New York City, from Dec. 7 to Dec. 10.



THE WEEKLY PRICE GUIDE

IRON AND STEEL

PIG IRON—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	Current	One Year Ago
No. 2 Southern	$45.60	$29.80
Northern Basic	51.30	27.55
Southern Ohio No. 2	47.80	28.55
NEW YORK—TIDEWATER DELIVERY		
2X Virginia (Silicon 2.25 to 2.75)	54.30	31.90
Southern No. 2 (Silicon 2.25 to 2.75)	49.70	33.95
BIRMINGHAM		
No. 2 Foundry	42.00@44.00	25.75
PHILADELPHIA		
Eastern Pa., No. 2x, 2.25-2.75 sil.	50.00	30.65
Virginia No. 2	50.00*	30.85
Basic	48.00†	29.90
Grey Forge	45.00*	29.90
CHICAGO		
No. 2 Foundry local	46.40	27.25
No. 2 Foundry, Southern	48.00	31.75
PITTSBURGH, INCLUDING FREIGHT CHARGE FROM VALLEY		
No. 2 Foundry	49.00	28.15
Basic	48.50	27.15
Bessemer	50.00	29.35
MONTREAL		
Silicon 2.25 to 2.75%	43.25	

* F.o.b. furnace. † Delivered.

STEEL SHAPES—The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses at the cities named:

	New York Current	New York One Month Ago	New York One Year Ago	Cleveland Current	Cleveland One Year Ago	Chicago Current	Chicago One Year Ago
Structural shapes	$4.58	$3.97	$3.47	$5.00	$3.37	$3.97	$3.47
Soft steel bars	4.73	4.12	3.37	4.50	3.27	3.87	3.37
Soft steel bar shapes	4.73	4.12	3.37		3.27	3.87	3.37
Soft steel bands	6.43	5.32	4.07	6.25			
Plates, ¼ to 1 in. thick	4.78	4.17	3.67	4.50	3.57	4.17	3.67

BAR IRON—Prices per 100 lb. at the places named are as follows:

	Current	One Year Ago
Mill, Pittsburgh	$4.25	$2.62
Warehouse, New York	4.57	3.37
Warehouse, Cleveland	3.52	3.22
Warehouse, Chicago	3.75	3.37

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Large Mill Lots Pittsburgh	New York Current	New York One Year Ago	Cleveland	Chicago
No. 10	3.55-7.00	7.23@8.00	4.57	8.10	7.02
No. 12	3.60-7.05	7.28@8.05	4.57	8.15	7.07
No. 14	3.65-7.10	7.33@8.10	4.67	8.20	7.12
No. 16	3.75-7.20	7.43@8.20	4.77	8.30	7.22
Black					
Nos. 18 and 20	4.20-6.20	8.41@9.80	5.30	8.70	7.80
Nos. 22 and 24	4.25-6.25	8.46@9.85	5.35	8.75	7.85
No. 26	4.30-6.30	8.51@9.90	5.40	8.80	7.90
No. 28	4.35-6.35	8.61@10.00	5.50	8.90	8.00
Galvanized					
No. 10	4.70-8.00	8.91@11.50	6.20	9.00	8.15
No. 12	4.80-8.10	9.01@11.50	6.25	9.10	8.20
No. 14	4.80-8.10	9.01@11.60	6.30	9.10	8.35
Nos. 18 and 20	5.10-8.40	9.26@11.90	6.60	9.40	8.65
Nos. 22 and 24	5.25-8.55	9.41@12.05	6.75	9.55	9.05
No. 26	5.40-8.70	9.56@12.20	6.90	9.70	9.20
No. 28	5.70-9.00	9.86@12.50	7.20	10.00	9.50

Acute scarcity in sheets, particularly black, galvanized and No. 16 blue enameled.

Automobile sheets are unavailable except in fugitive instances, when prices are 9.45c per lb. for No. 16; 9.50 for Nos. 18 and 20, and 9.55c for Nos. 22 and 24.

COLD FINISHED STEEL—Warehouse prices are as follows:

	New York	Chicago	Cleveland
Round shafting or screw stock, per 100 lb. base	$6.36	$5.80	$6.00
Flats, square and hexagons, per 100 lb. base	6.86	6.30	6.50

DRILL ROD—Discounts from list price are as follows at the places named:

	Per Cent.
New York	50
Cleveland	50
Chicago	50

NICKEL AND MONEL METAL—Base prices in cents per pound F.O.B. Bayonne, N. J.

Nickel	
Ingot and shot	43
Electrolytic	45

Monel Metal			
Shot and blocks	35	Hot rolled rods (base)	40
Ingots	38	Cold rolled rods (base)	56
Sheet bars	40	Hot rolled sheets (base)	55
Special Nickel and Alloys			
Malleable nickel ingots			42
Malleable nickel sheet bars			47
Hot rolled rods, Grades "A" and "C" (base)			60
Cold drawn rods, grades "A" and "C" (base)			72
Copper nickel ingots			45
Hot rolled copper nickel rods (base)			54
Manganese nickel hot rolled (base) rods "D" — low manganese			62
Manganese nickel hot rolled (base) rods "D" — high manganese			67

Domestic Welding Material (Swedish Analysis)—Welding wire in 100-lb lots sells as follows, f.o.b. New York: 5/32, 8½c. per lb.; ⅛, 8c.; 5/32 to ¼, 7½c. Domestic iron sells at 12c. per lb.

MISCELLANEOUS STEEL—The following quotations in cents per pound are from warehouse at the places named:

	New York Current	Cleveland Current	Chicago Current
Openhearth spring steel (heavy)	7.00	8.00	9.00
Spring steel (light)	10.00	11.00	12.25
Coppered bessemer rods	9.00	8.00	7.50
Hoop steel	6.68	6.50	5.32
Cold-rolled strip steel	12.50	8.25	10.75
Floor plates	6.91	6.00	6.91

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the Pittsburgh basing card:

BUTT WELD

Inches	Steel Black	Steel Galvanized	Inches	Iron Black	Iron Galvanized
¼ to 3	54–57½%	41½–44%	⅜	15½–25½%	+1½–11½%
			½	19½–29½%	1½–11½%
			¾ to 1¼	24½–34½%	8–18½%

LAP WELD

2	47–50½%	34½–38%	1¼		
2½ to 6	50–53½%	37½–41%	1½		
7 to 12	47–50½%	33½–37%	2	20½–28½%	6½–14½%
13 to 14	37½–41%		4½ to 6	22½–30½%	9½–17½%
15	35–38½%		2½ to 4	22½–30½%	9½–17½%
			7 to 12	19½–27½%	6½–14½%

BUTT WELD, EXTRA STRONG PLAIN ENDS

¼ to 1½	52–55½%	39½–43%	¼ to ⅜	24½–34½%	9½–19½%
2 to 3	53–56½%	40½–44%			

LAP WELD, EXTRA STRONG PLAIN ENDS

2	45–48½%	33½–37%	1¼		
2½ to 4	48–51½%	36½–40%	1½		
4½ to 6	47–50½%	35½–39%	2	21½–29½%	8½–16½%
7 to 8	43–46½%	29½–33%	2½ to 4	23½–31½%	11½–19½%
9 to 12	38–41½%	24½–28%	4½ to 6	22½–30½%	10½–18½%
			7 to 8	14½–22½%	2½–10½%
			9 to 12	9½–17½%	5½–+2½%

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
⅜ to 3 in. steel butt welded	38%	22%	39%	30%	54%-40%	40½@30%
2½ to 6 in. steel lap welded	33%	18%	41%	26%	50%@40%	37½@27½%

Malleable fittings. Classes B and C, banded, from New York stock sell at plus 45%. Cast iron, standard sizes, plus 5%.

METALS

MISCELLANEOUS METALS—Present and past New York quotations in cents per pound, in carload lots:

	Current	Month Ago	Year Ago
Copper, electrolytic	18.50	19.25	21.75
Tin in 5-ton lots	45.50	61.50	70.00
Lead	8.50	9.00	5.50
Zinc	8.50	8.70	8.00
ST. LOUIS			
Lead	8.00	8.87½	5.25
Zinc	7.70@8.05	8.37½	7.65

At the places named, the following prices in cents per pound prevail, for 1 ton or more:

	New York Current	New York Month Ago	New York Year Ago	Cleveland Current	Cleveland Year Ago	Chicago Current	Chicago Year Ago
Copper sheets, base	29.50	33.50	29.50	34.00	33.50	36.00	36.50
Copper wire (carload lots)	31.25	31.25	26.50	29.00	29.50	29.00	25.00
Brass sheets	28.50	28.50	23.00	36.00	29.00	27.00	28.00
Brass pipe	33.00	33.00	34.00	34.00	36.00	34.00	37.00
Solder (half and half) (case lots)	35.00	33.00	45.00	40.50	41.00	38.00	41.00

Copper sheets quoted above hot rolled 16 oz., cold rolled 14 oz. and heavier, add 2c.; polished takes 5c. per sq.ft. extra for 20-in. widths and under; over 20 in., 7½c.

BRASS RODS—The following quotations are for large lots, mill, 100 lb. and over, warehouse; net extra:

	Current	One Year Ago
Mill	25.00	19.00
New York	27.00	21.50
Cleveland	27.00	30.00
Chicago	30.00	30.00

SHOP MATERIALS AND SUPPLIES

ZINC SHEETS—The following prices in cents per pound are f.o.b. mill + less 8% for carload lots 12.50

	Warehouse			
	—In Casks—		— Broken Lots —	
	Current	One Year Ago	Current	One Year Ago
Cleveland	15.00	12.50	15.50	13.00
New York	14.00	11.50	14.50	12.50
Chicago	15.00	16.50	15.00	16.00

ANTIMONY—Chinese and Japanese brands in cents per pound, in ton lots for spot delivery, duty paid:

	Current	One Year Ago
New York	7.25	9.50
Chicago	9.00	9.75

OLD METALS—The following are the dealers' purchasing prices in cents per pound:

	— New York —			
	Current	One Year Ago	Cleveland	Chicago
Copper, heavy, and crucible	15.00	17.00	14.00	15.00
Copper, heavy, and wire	14.00	16.00	13.50	14.50
Copper, light, and bottoms	12.50	14.00	12.00	13.00
Lead, heavy	7.00	4.75	7.00	7.00
Lead, tea	5.00	3.75	4.00	6.00
Brass, heavy	9.50	10.50	10.00	14.50
Brass, light	7.00	7.50	7.00	8.00
No. 1 yellow brass turnings	8.50	10.00	7.50	8.00
Zinc	5.00	5.00	4.50	5.50

ALUMINUM—The following prices are from warehouse at places named:

	New York	Cleveland	Chicago
No. 1 aluminum, 98 to 99% pure, in ingots for remelting (1-15 ton lots), per lb	$33.00	$33.00	$33.50

COPPER BARS—From warehouse sell as follows in cents per pound, for ton lots and over:

	Current	One Year Ago
New York (round)	38.00	33.00
Chicago	29.00	31.00
Cleveland	34.00	35.00

BABBITT METAL—Warehouse price per pound:

	—New York—		—Cleveland—		— Chicago —	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Best grade	90.00	90.00	57.00	70.00	60.00	60.00
Commercial	50.00	50.50	21.00	16.50	15.00	13.00

SHOP SUPPLIES

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	— New York —		— Cleveland —		— Chicago —	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Hot pressed square	+ $6.00	$1.50	List net	$2.25	List	1.85
Hot pressed hexagon	+ 6.00	1.50	List net	2.25	List	1.85
Cold punched hexagon	+ 6.00	1.50	List net	2.25	List	1.30
Cold punched square	+ 6.00	1.50	List net	2.25	List	1.30

Semi-finished nuts, ⅝ and smaller, sell at the following discounts from list price:

	Current	One Year Ago
New York	30%	50-10%
Chicago	50%	50%
Cleveland	50%	60-10-10%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
½ by 4 in. and smaller	+ 20%	25%	20%
Larger and longer up to 1¼ in. by 30 in.	+ 20%	25%	10%

WASHERS—From warehouses at the places named the following amount is deducted from list price:

For wrought-iron washers:
New York ..... list Cleveland ..... $2.00 Chicago $3.00

For cast-iron washers, ⅜ and larger, the base price per 100 lb. is as follows:
New York ..... $7.00 Cleveland ..... $4.50 Chicago $4.75

CARRIAGE BOLTS—From warehouses at the places named the following discounts from list are in effect:

	New York	Cleveland	Chicago
½ by 6 in. and smaller	+ 20%	25%	10%
Larger and longer up to 1 in. by 30 in.	+ 20%	20%	5%

COPPER RIVETS AND BURS sell at the following rate from warehouse:

	Rivets		Burs	
	Current	One Year Ago	Current	One Year Ago
Cleveland	20%	20%	10%	10%
Chicago	net	20%	net	20%
New York	25%	40%	net	20%

RIVETS—The following quotations are allowed for fair-sized orders from warehouse:

	New York	Cleveland	Chicago
Steel ⅞ and smaller	List Net	40%	30%
Tinned	List Net	40%	30%

Boiler, ½, ⅝, 1 in. diameter by 2 to 5 in. sell as follows per 100 lb.:
New York ..... $6.00 Chicago ..... $5.62 Pittsburgh $4.5

Structural, same sizes:
New York ..... $7.10 Chicago ..... $5.72 Pittsburgh $4.60

MISCELLANEOUS

SEAMLESS DRAWN TUBING—The base price in cents per pound from warehouse in 100-lb. lots is as follows:

	New York	Cleveland	Chicago
Copper	$34.00	$36.00	$35.00
Brass	33.00	36.00	34.00

The prices, of course, vary with the quantity purchased. For lots of less than 100 lb., but not less than 75 lb., the advance is 1 c.; for lots of less than 75 lb., but not less than 50 lb., 2½c. over base (100-lb. lots); less than 50 lb., but not less than 25 lb., 5c. should be added to base price; quantities from 10-25 lb., extra is 10c.; less than 10 lb., add 15-20c.

Double above extras will be charged for angles, channels and sheet metal mouldings if ordered in above quantities. Above extras also apply to brass rod other than standard stock sizes—stock sizes being considered as ⅛-2 in. inclusive in rounds, and ¼-1½ in., inclusive, in square and hexagon—all varying by thirty seconds up to 1 in. by sixteenths over 1 in. On shipments aggregating less than 100 lb., there is usually a boxing charge of $1.50.

LONG TERNE PLATE—In Chicago No. 28 primes from stock sell, nominally, for $12.50 per 100 lbs.

In Cleveland—$10 per 100 lbs.

COTTON WASTE—The following prices are in cents per pound:

	— New York —			
	Current	One Year Ago	Cleveland	Chicago
White	15.00@17.00	13.00	16.00	11.00 to 14.00
Colored mixed	9.00@14.00	9.00-12.00	12.00	9.50 to 12.00

WIPING CLOTHS—Jobbers' price per 1000 is as follows:

	13½x13½	13½x20½
Cleveland	55.00	65.00
Chicago	41.00	43.50

SAL SODA sells as follows per 100 lb.:

	Current	One Month Ago	One Year Ago
New York	$2.00	$3.00	$1.75
Philadelphia	2.75	2.75	1.75
Cleveland	3.00	2.50	2.75
Chicago	2.00	2.50	2.00

ROLL SULPHUR in 360-lb. bbl. sells as follows per 100 lb.:

	Current	One Month Ago	One Year Ago
New York	$3.90	$3.90	$3.65
Philadelphia	3.65	3.65	3.62
Chicago	4.10	5.00	4.12½

COKE—The following are prices per net ton at ovens, Connellsville:

	September 19	September 13	September 6
Prompt furnace	$17.00@$18.00	$17.00@$18.00	$17.00@$18.00
Prompt foundry	18.00@20.00	18.00@20.00	18.00@20.00

FIRE CLAY—The following prices prevail:

		Current
Ottawa, bulk in carloads	Per Ton	$8.00
Cleveland	100-lb. bag	1.00

LINSEED OIL—These prices are per gallon:

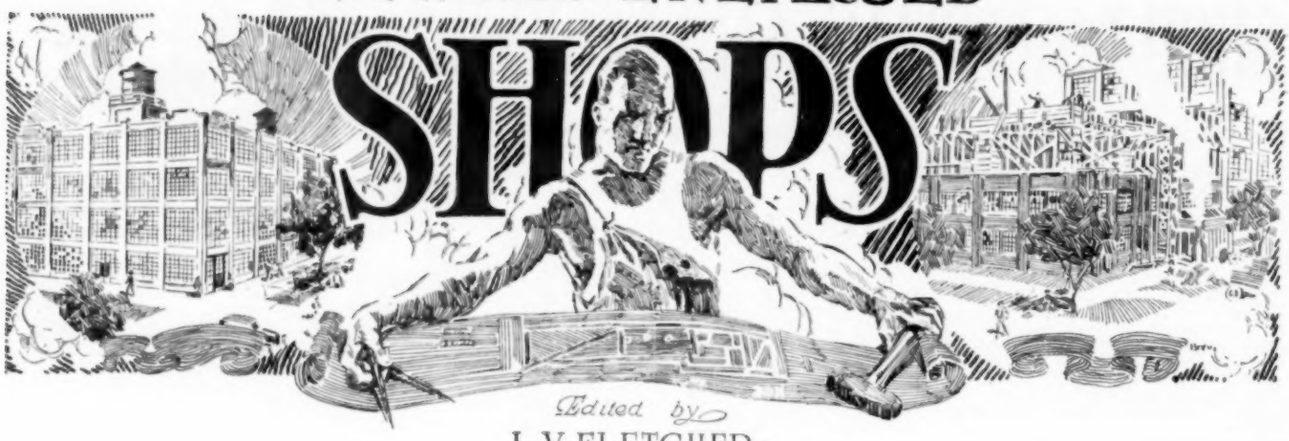
	—New York—		—Cleveland—		—Chicago—	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Raw in barrels, (5 bbl. lots	$1.25	$2.15	$1.55	$2.50	$1.22	$2.37
5-gal cans	1.40	2.30	1.75	2.75	1.47	2.57
1-gal cans (6 to case)	1.45	....	....	....	....	....

WHITE AND RED LEAD—Base price per pound:

	Red				White	
	Current		One Year Ago		Current	One Year Ago
	Dry	In Oil	Dry	In Oil	Dry and In Oil	Dry and In Oil
100 lb. keg	15.50	17.00	13.00	14.50	15.50	13.00
25 and 50-lb. kegs	15.75	17.25	13.25	14.75	15.75	13.25
12½-lb. keg	16.00	17.50	13.50	15.00	16.00	13.50
5-lb. cans	18.50	20.00	15.00	16.50	18.50	15.00
1-lb. cans	20.50	22.00	16.00	17.50	20.50	16.00

500 lb. lots less 10% discount. 2000 lb. lots less 10-2½% discount.

NEW and ENLARGED SHOPS



Edited by
L·V·FLETCHER

Machine Tools Wanted

If in need of machine tools send us a list for publication in this column

Conn., New London — T. Ragonese, 721 Bank St.—repair equipment for garage.

Md., Baltimore—The Delion Tire & Rubber Co., 131 West Mt. Royal Ave., R. B. Arnold, Purch. Agt.—machine tools for the manufacture of automobile tires and tubes.

N. Y., New York (Borough of Brooklyn) —The Gloria Motor Co., 40 Court St.—miscellaneous machine tools.

N. Y., New York (Borough of Manhattan)—J. Katsaris, 517 8th Ave.—1 power flat rolling machine, 8 in. wide.

N. Y., New York (Borough of Queens)—The Saks Stamping Co., 227 Borden Ave., Long Island City—one No. 30 Bliss arch press.

N. Y., Buffalo — The Charles Machine Wks., 368 Elm St.—milling machine, surface grinder and cutter grinder.

N. Y., Buffalo — Green & Lauctot, 326 Niagara St.—combination cross and rip saw.

N. Y., Buffalo—The Lambert Press, 813 Seneca St.—electrical welding equipment and tools.

N. Y., Buffalo—The Simplex Commercial Body Co., 1170 Jefferson St.—one hollow chisel mortiser.

N. Y., Buffalo—Willard Machine Wks., 73 Forest Ave.—one 3 or 3½ ft. American radial drill.

N. Y., Hilton—The Quality Buttons, Inc. —one 20 in. plain drill press (used).

N. Y., Jamestown — The Crescent Tool Co., Foote and Harrison St.—24 drop hammers, weighing from 800 to 2,000 lbs.

Pa., Easton—The Butler Edwards Electric Co.—equipment for easy and rapid production of automobile rear axle shafts.

Pa., Philadelphia—J. W. Keller, North Amer. Bldg.—one 18 in. engine lathe.

Pa., Philadelphia—The Keystone Welding and Machine Wks., Germantown Ave. and Stenton St.—machine tools.

Pa., Philadelphia—W. W. Lindsley, Harrison Bldg.—one upsetter.

Pa., Philadelphia — Richmond & Kemp, 1840 Germantown Ave.—one 24 in. heavy duty drill press.

Pa., Philadelphia—The Quaker Tool Co., Venango and Hope Sts.—machine tools.

Pa., Philadelphia—The Schuylkill Forge Co., 3d and Luzerne Sts.—machine shop equipment.

Pa., Philadelphia—The Vim Motor Truck Co., 23d and Market Sts.—machine shop equipment.

Pa., Pittsburgh — The Wholesale Equipment and Supply Co., 1002 Farmers' Bank Bldg.—one multiple drill similar to No. 30 National.

Pa., Steelton—The Bethlehem Steel Co.—5-spindle machine for 1 in. drills.

Pa., York—W. E. Duff Co.—a 27 in. high speed upright drilling machine.

La., New Orleans — C. Laporte, Typewriter Repair & Sales Co., 238 Royal St.—typewriter tools of all kinds, also lathe (used one preferred) for typewriter repair purposes and grinding.

La., New Orleans—C. Ziebermann, 801 Baronne St.—auto accessories and hand press for pressing bushings of about 5 tons.

Va., Norton—The Norton Armature Wks. —belt driven lathe about 24 in. x 8 ft. bed (used).

Mich., Detroit—L. F. R. Bellows & Co., 44 Cherry St.—shear to cut 2 x 2 x ¼ in. angles.

Mich., Detroit—W. J. Dousett and H. P. Reed, Jackson—service station equipment.

Mich., Detroit—The Liberty Machine Screw Co., Rivard and Maple Sts.—miscellaneous machine tools.

Mich., Detroit—The E. F. Lyon Co., 14 Antoinette Ave. — miscellaneous equipment for finishing springs.

Mich., Detroit—P. Schock, 1604½ Baldwin Ave.—small tool equipment for garage.

Mich., Ecorse—The Acme Machine Co.—screw machines.

Mich., Kalamazoo — The Kalamazoo Sedan Co., C. C. Bobb, Pres.—miscellaneous equipment for making inclosed bodies.

Mich., Monroe—The Monroe Auto Equipment Co., East 1st St.—general foundry equipment.

Wis., Manitowoc—The Clark Oil Co., 10th and York Sts.—garage repair machinery.

Wis., Milwaukee—The Bernert Mfg. Co., 489 12th St., J. Bernert, Purch. Agt.—several drill presses and lathes.

Wis., Milwaukee — The Packard Motor Service Co., 350† Grand Ave., R. Chidester, Purch. Agt. — repair machinery, lathes, drills, etc.

Tex., Dallas—G. H. Wierteson, 2506 Main Main St.—punch presses, lathe and drill press (new or used).

Ont., Ottawa—The General Supply Co. of Canada, 356 Soarks St.—one 60 in. duplex horizontal driving box boring machine, arranged for a.c. motor, also a horizontal axle box boring machine with adjustable table.

Machinery Wanted

Conn., Bridgeport — W. F. Scalley, 403 State St.—woodworking machine (used if in good condition).

Maine, New Gloucester—Macdonhoc Box Co.—job presses (any size, either foot, hand or power).

Mass., Amesbury—The P. W. J. Murphy Co.—wood screw machinery.

Mass., Greenfield — The Greenfield Tap and Die Corp.—additional machinery, etc.

Md., Baltimore — The Kennedy Corp., Charles and Wells St., manufacturer of iron castings, etc.—machinery and equipment.

N. Y., New York (Borough of Brooklyn) —The Eichman Co., 7 McKibbon St.—general line of woodworking machinery.

N. Y., New York (Borough of Manhattan)—The Electric Bond & Share Co., 71 Bway. — one 65 ton overhead traveling crane.

Ill., Chicago—The Lanski Co., 2331 Ogden Ave.—Maddox rubbing machine.

Mich., Delray (Detroit P. O.)—The Inland, Delray Salt Co.—equipment for manufacturing and packing salt.

Mich., Detroit—N. J. Aulbach, 178 Stimson St.—upright Mortiser machine for woodworking shop.

La., New Orleans—The Universal Folding Crate, Inc., 601 Bourbon St.—one double spindle wood boring machine with a spread of 6 in. to 22 in. between spindle carrying ¼ in. drill (new or used).

S. C., Greensboro—The Proximity Mercantile Co.—one or two 16 x 24 in. woodworking planers of light weight type, suitable for surfacing and dressing boards up to 4 in. thick.

O., Alliance—The Alliance Brick Co., Sebring Rd.—brick-making machinery.

Wis., Black Creek—The Ontagamie Limestone Co.—J. B. Huhn, Purch. Agt.—loading crane.

Wis., Eau Claire—The Eau Claire Paper Mfg. Co., c/o W. Brubacher, Otter Creek Mills—traveling crane.

Wis., Janesville — The Samson Tractor Co.—traveling crane.

Wis., Merton—The Merton Dairy Products Mfg. Co.—machinery for dairy manufacturing.

Wis., Milwaukee—B. Boelke, 868 5th St. —mono-rail crane.

Wis., Milwaukee—Doelger & Kirsten, 505 Cedar St., O. Kirsten, Purch. Agt.—hand power crane.

Metal Working

NEW ENGLAND STATES

Conn., Ansonia—The Amer. Brass Co., 58 Liberty St., plans to build several large additions to its plant on Bridge St.

Conn., New London—T. Ragonese, 721 Bank St., will soon award the ontract for the construction of a 2 story, 40 x 55 ft. garage and service station. Estimated cost, $40,000. Private plans.

Conn., Waterbury—The Lux Clock Mfg. Co., 105 Sperry Ct., will soon award the contract for the construction of a 4 story, 25 x 105 ft. factory. Estimated cost, $50,000. Noted Sept. 2.

Maine, Eastport—The Sea Coast Canning Co. plans to build a canning plant. Estimated cost, $300,000.

Mass., Palmer—The Palmer Fdry. & Machine Co., 27 Foundry St., has awarded the contract for the construction of a 1 story foundry. Cost between $15,000 and $20,000.

Mass., Roxbury — The Duncan-Donahue Co. will soon award the contract for the construction of a 1 story garage and repair shop on Peabody St. Estimated cost, $25,000. McLoughlin & Burr, 88 Tremont St., Boston, Archts.

Mass., Salem—D. J. Long Co., 377 Essex St. (machinists), plans to build a 1 story addition to plant on Goodhue St. Estimated cost, $10,000. Priate plans.

Mass., Worcester — T. Smith & Co., 288 Grove St., plans to build a factory for the manufacture of bolts, etc. Private plans.

N. H., Portsmouth — The Portsmouth Auto Body Co. will soon award the contract for the construction of a 2 story addition to plant. Estimated cost, $30,000. J. E. Richardson, 56 Grove St., Dover, Archt.

R. I., Cumberland—The Standard Nut & Bolt Co. has awarded the contract for the construction of a 1 story, 60 x 80 ft. addition to plant on Abbott St. Estimated cost, $25,000.

R. I., Pawtucket—The H. and B. Amer. Machine Co., Ltd., Pleasant View Ave., will soon award the contract for the construction of a 1 story, 40 x 100 ft. machine shop. Estimated cost, $30,000. F. P. Sheldon & Sons, 1003 Rhode Island Hospital Trust Bldg., Providence, Archts. and Engrs.

R. I., Providence — The Enterprise Real Estate Corp., 76 Dorrance St., plans to build a 1 story garage and service station on Bway. Estimated cost, $10,000. Private plans.

R. I., Providence—H. and D. Malinowitz, Prairie Ave., plans to build a 1 story garage and service station. Estimated cost, $25,000. Private plans.

R. I., Providence — The Packard Motor Car Co., Washington St., has awarded the contract for the construction of a 1 story, 70 x 150 ft. service station on Aborn St. Estimated cost, $40,000.

R. I., Providence—M. E. Simmons, Pearl St., will soon award the contract for the construction of a 1 story garage on Pearl St. near Rice St. Estimated cost, $35,000. Private plans.

R. I., Providence—R. T. Slade, 547 Elmwood Ave., plans to build a 1 story addition to its garage on Elmwood Ave. Estimated cost, $50,000.

R. I., Providence—The Smith Realty Co. plans to build a 1 story garage, etc., on Chapel St. Cost between $40,000 and $50,000.

R. I., Providence — The Swiss Cleaning Co., 675 Elmwood Ave., plans to build a 1 story addition to its garage. Estimated cost, $10,000. Private plans.

R. I., Woonsocket—The Amer. Wringer Co., 91 Social St., will soon award the contract for the construction of a 1 story, 80 x 110 ft. dry kiln building and a 2 story, 66 x 180 ft. brick and steel mechanical roll building. Cooley & Marvin Co., 15 Ashburton Pl., Engrs. and Archts.

MIDDLE ATLANTIC STATES

Md., Baltimore — The P. Kell Co., Inc., Halliday and Center Sts., is having plans prepared for the construction of a 1 and 2 story, 70 x 165 ft. sheet metal working plant. Estimated cost, $100,000. Private plans.

Md., Baltimore — The Kennedy Corp., Charles and Wells St., manufacturer of iron castings, etc., plans to purchase adjoining property and build extensions to plant. Estimated cost, $100,000.

Md., Frederick — Price Bros., manufacturers of castings, screw machine products, etc., plan to build additions to their plant.

N. Y., New York (Borough of Brooklyn) —The Charshad Realty Co., 1199 Eastern Parkway, will build a 1 story, 120 x 200 ft. garage on Empire Blvd. Estimated cost, $50,000.

N. Y., New York (Borough of Brooklyn) —J. Gootzeit, 3031 Steuben St., Middle Village, will build a 1 story, 100 x 150 ft. garage on Nassau Ave. here. Estimated cost, $50,000.

N. Y., New York (Borough of Manhattan)—The Building Assn. Corp., 301 West 33d St., has awarded the contract for the construction of a 3 story, 80 x 180 ft. garage at 314 11th Ave. Estimated cost, $50,000.

N. Y., New York (Borough of Manhattan)—The Colonial Sand and Stone Co., 615 West 49th St., will build a 2 story garage at 642 West 50th St. Estimated cost, $40,000.

N. Y., New York (Borough of Manhattan)—The Five Sixty Three West Fifty Ninth St. Co. has awarded the contract for altering a 4 and 5 story, 100 x 125 ft. garage and service station at 557 West 59th St. Estimated cost, $75,000.

N. Y., New York (Borough of Manhattan)—L. W. Gallagher, 501 West 142d St., will build a 1 story, 100 x 100 ft. garage on North St. near Davidson Ave. Estimated cost, $30,000.

N. Y., New York (Borough of Manhattan)—The Hup Realty Co., 229 East 38th St., will build a 1 story garage at 317 East 38th St. Estimated cost, $35,000.

N. Y., New York (Borough of Manhattan)—A. J. Paladina, 2254 1st Ave., will build a 1 story, 75 x 100 ft. garage at 437 East 120th St. Estimated cost, $25,000.

N. Y., Jamaica—The E. Langer Printing Co., 470 West Bway., New York City, has awarded the contract for the construction of a 3 story, 100 x 300 ft. printing plant on Hamilton Ave. here.

N. Y., Jamestown — The Crescent Tool Co., Foote Ave. and Harrison St., is constructing a 1 story, 44 x 144 ft. forge shop and also a 3 story building to house an anthracite gas producer.

Pa., Bridgeville — The Natl. Lamp Co., Nela Park, East Cleveland, Ohio, has awarded the contract for the construction of a 3 story, 63 x 129 ft. factory and warehouse here. Estimated cost, $100,000.

Pa., Frankford — The Fidelity Machine Co., c/o G. B. Roth, Archt., 1629 Chestnut St., is having plans prepared for the construction of a 2 story, 100 x 200 ft. factory.

Pa., Philadelphia — C. Heinberger, 18th and Blavis Sts., has awarded the contract for the construction of a 1 story garage on Germantown and Mt. Pleasant Sts. Estimated cost, $35,000.

Pa., Philadelphia — The Schuylkill Forge Co., 3d and Luzerne Sts., has awarded the contract for the construction of a 1 story, 37 x 101 ft. machine shop. Estimated cost, $10,000.

Pa., Philadelphia—The Vim Motor Truck Co., 23d and Market Sts., has awarded the contract for the construction of a 1 story, 50 x 100 ft. machine shop on Fox and Roberts Sts. Estimated cost, $48,000.

Pa., Pittsburgh—The Whitehill Motors, Inc., 5707 Friendship Ave., has awarded the contract for the construction of a 2 story, 80 x 115 ft. garage on Euclid Ave. Estimated cost, $100,000.

MIDDLE WEST STATES

Ill., Chicago—The McKeown Transportation Co. will soon award the contract for the construction of a 1 story, 125 x 200 ft. garage at 1447 West 63d St. Estimated cost, $90,000. Z. L. Davis, 64 East Van Buren St., Archt.

Ill., East St. Louis — The Eagle-Picher Lead Co., Ry. Exch. Bldg., St. Louis, Mo., has awarded the contract for the construction of a group of buildings to include a furnace building, boiler room, laboratory, machine shop, office, warehouse and service building. Estimated cost, $600,000.

Ind., Terre Haute—The Hoosier Rolling Mills Co. will build a 1 story, 100 x 600 ft. factory. Estimated cost, $100,000.

Mich., Detroit—W. J. Dousett and H. P. Reed, Jackson, Mich., have awarded the contract for the construction of a 1 story, 82 x 88 ft. service station on Blackstone St. here. Estimated cost, $21,000.

Mich., Detroit—The E. F. Lyon Co., 14 Antoinette Ave., manufacturer of auto parts, plans to alter and build a 1 story, 96 x 125 ft. addition to its factory on Euclid Ave. Estimated cost, $15,000.

Mich., Detroit—P. Schock, 1604½ Baldwin Ave., has had plans prepared for the construction of a 2 story, 35 x 62 ft. garage on Mt. Elliott Ave. Estimated cost, $25,000. H. Kohner and A. J. Seeler, 1402 Kresge Bldg., Archts.

Mich., Monroe—The Monroe Auto Equipment Co., East 1st St., has awarded the contract for the construction of a 1 story, 90 x 210 ft. foundry. Estimated cost, $100,000. Noted Sept. 9.

O., Akron—The McNeil Boiler Co., East Crosier and Sweitzer Sts., has increased its capital stock from $100,000 to $500,000 and plans to enlarge its plant.

O., Canton—The United Eng. and Fdry. Co. has awarded the contract for the construction of a 1 story, 136 x 240 ft. factory on Grace Ave., N.E., and 13th St., N.E., for the manufacture of roll iron castings and rolling mill machinery. Estimated cost, $75,000.

O., Cleveland—The Clay Engine Mfg. Co. 864 East 72d St., plans to build a 1 story factory. Estimated cost, $50,000. H. H Newman, Mgr.

O., Cleveland — The Cleveland Folding Bed Co., 2554 East 55th St., will soon award the contract for the construction of a 2 story, 70 x 70 ft. addition to its factory at 3740 Central Ave. Estimated cost, $50,000. M. Altschuld, East 51st and Woodland Ave., Archt.

O., Cleveland — The National Malleable Castings Co., Woodhill Rd., plans to build a 1 story, 60 x 200 ft. machine shop on Woodhill Rd. and Quincy Ave. Estimated cost, $100,000. H. F. Pope, Pres. J. Moffett, c/o owner, Engr. and Archt.

O., Cleveland—The Orange Garage Co. has awarded the contract for the construction of a 1 story, 65 x 130 ft. garage on Orange Ave. Estimated cost, $50,000.

O., Cleveland—The Superior Screw & Bolt Mfg. Co., 810 Hippodrome Bldg., has awarded the contract for the construction of a 2 story, 64 x 80 ft. factory and garage at 3652 East 93d St. Estimated cost, $40,000.

O., Cleveland — The Warnsman Truck Body Co., 5818 Walworth Ave., has awarded the contract for the construction of a 1 story, 30 x 40 ft. factory. Estimated cost, $10,000. Private plans.

O., Copley—The Welman Seaver Morgan Co., 7000 Central Ave., Cleveland, manufacturers of cranes and machinery, is having plans prepared for the construction of a 1 story, 100 x 300 ft. tractor plant here. Estimated cost, $200,000.

O., Dayton — The Miller Airplane Co. plans to build a 2 story airplane factory on Brown St. Estimated cost, $100,000.

O., London—The Williams Mfg. Co. has awarded the contract for the construction of a 1 story, 50 x 180 ft. factory for the manufacture of steel wool. Estimated cost, $45,000.

O., Marietta—The Safe Cabinet Co. is having sketches made for a 3 story addition to its factory.

O., Niles—The National Lamp Co., Nela Park, East Cleveland, has awarded the contract for the construction of a 3 story, 50 x 150 ft. factory and warehouse here. Estimated cost, $75,000.

Wis., Milwaukee — The General Welding & Mfg. Co., 347 Florida St., has awarded the contract for the construction of a 1 story, 30 x 40 ft. addition to its factory. Estimated cost, $9,000. Noted Aug. 5.

WEST OF THE MISSISSIPPI

Col., Denver—The Denver Rockdrill Co., 39th and Gilpin Sts., is building a 3 story, 75 x 125 ft. factory. Estimated cost, $100,000.

Col., Denver—The Eaton Metal Products Co., 1843 Wazee St., is having plans prepared for the construction of a factory for the manufacture of steel products on York Ave. near Union Pacific Shops. Estimated cost, $175,000.

Col., Denver—The Savage Harvester Co., Inc., plans to erect a factory for the manufacture of harvesters and tractors.

Iowa, Cedar Rapids—The First Ave. Investment Co. plans to build a 2 story, 60 x 140 ft. garage. Estimated cost, $120,000.

Minn., Freeport — The Borgerding Lumber Co. has awarded the contract for the construction of a 1 story, 25 x 58 ft. machine shed. Estimated cost, $25,000.

Minn., Minneapolis—P. Joncas, 1082 14th Ave., S.E., plans to build a 1 story, 66 x 165 ft. garage and repair shop on 7th St. S.E., and East Hennepin Ave. Estimated cost, $25,000. L. F. Collins, 207 East Hennepin Ave., Archt.

Minn., Redwood Falls — R. Stensvad plans to build a 1 story, 120 x 120 ft. garage. Estimated cost, $50,000.

Minn., St. Paul—A. G. and C. H. Siems and R. A. Schaffner, of St. Paul, and C. P. Stembel, of Minnapolis, have awarded the contract for the construction of a 1 story, 150 x 650 ft. repair plant, also lumber mill, blacksmith shop, storehouse, lumber shed, material platform and offices on North Como Ave., St. Paul, and on Como Ave., Minneapolis. Estimated cost, $250,000.

Mo., St. Louis—The Bridge & Beach Mfg. Co., 503 South 1st St., has awarded the contract for the construction of a factory for the manufacture of stoves and ranges on Union and Brown Aves. Estimated cost, $800,000.

Tex., Beaumont—C. Sigler plans to build a sawmill with 25,000 ft. daily capacity. Estimated cost, $18,000.

Tex., Ft. Crockett — The Construction Quartermaster here will soon award the contract for an addition to the machine shop.

WESTERN STATES

Cal., Ft. Winfield Scott — The Construction Quartermaster here will soon award the contract for the construction of a machine shop.

Ore., Ft. Stevens — The Construction Quartermaster here will soon award the contract for the construction of a machine shop.

Wash., Ft. Worden — The Construction Quartermaster here will soon award the contract for the construction of a machine shop.

CANADA

Que., Lachine—The Weir Eng. Co., Glasgow, Scotland, has purchased a 16 acre site here and plans to build a plant.

Que., Montreal — The L'air Liquide Society, Maisoneuve, plans to build additions to its welding and cutting plants here.

General Manufacturing

NEW ENGLAND STATES

Conn., Greenville (Norwich P. O.)—The Atlantic Carton Corp., South Golden St., has awarded the contract for the construction of a 2 story, 50 x 200 ft. carton factory. Estimated cost, $65,000.

Maine, Howland—The Howland Pulp & Paper Co., 301 Congress St., has awarded the contract for the construction of a 1 story, 38 x 72 ft. addition to its paper machine building and a 1 story, 75 x 103 ft. addition to its sulphate pulp mill. Estimated cost, $120,000.

R. I., Providence — The Waldorf Lunch Co., Byron St., has awarded the contract for the construction of a 2 story addition to its bakery. Estimated cost, $50,000. Noted Aug. 19.

R. I., Woonsocket—The Alsace Worsted Co. has awarded the contract for the construction of a 2 story, 66 x 180 ft. addition to its factory on East School St. Estimated cost, $75,000.

Mass., Cambridge—Ginn & Co., 15 Ashburton Pl., Boston, will soon award the contract for the construction of a 1 story, 70 x 200 x 400 ft. addition to its printing factory on 1st St. Estimated cost, $250,000. J. R. Worcester & Co., 79 Milk St., Boston, Mass., Engrs. and Archts.

Mass., Russell — The Chapin & Gould Paper Co., 317 Main St., Springfield, has awarded the contract for the construction of a 4 story factory here. Estimated cost, $100,000.

N. H., Groveton — The Groveton Paper Co., Inc., has awarded the contract for the construction of a 2 story, 55 x 200 ft. addition to its plant. Estimated cost, $100,000.

Vt., Northfield — H. Pelaggi & Co. will build 1 story, 60 x 425 ft. addition to its granite cutting plant. Estimated cost, $50,000.

MIDDLE ATLANTIC STATES

D. C., Washington—N. Auth Provision Co., 623 D St., S.W., has awarded the contract for the construction of a 1 story addition to its packing house. Estimated cost, $60,000.

N. J., Bridgeton—The Illinois Glass Co. has awarded the contract for the construction of a group of buildings, to include a 3 story, 330 x 700 ft. main plant, 50 x 150 ft. producer building and a 2 story, 50 x 100 ft. engine and boiler room on North Laurel St. Estimated cost, $3,000,000.

N. J., Trenton—The Mutual Pottery Co., Clinton Ave., has awarded the contract for the construction of a pottery plant, to include several buildings ranging from 1 to 5 story. Estimated cost, $500,000.

N. Y., New York (Borough of Brooklyn) —J. Oehrig, 7 McKibben St., is having sketches made for a 4 story, 100 x 100 ft. woodworking factory. Estimated cost, $125,000. Kunzi & Waillant, 394 Graham Ave., Engrs. and Archts.

N. Y., New York (Borough of Manhattan)—The New York Pie Baking Co., 82 Sullivan St., has awarded the contract for altering its 3 story bakery. Estimated cost, $150,000.

N. Y., Buffalo—The Drumstra Ice Cream Co., 958 Fillmore Ave., will soon award the contract for altering and building a 2 story, 50 x 90 ft. addition to its factory at 1615 Bway. Estimated cost, $60,000.

SOUTHERN STATES

Tenn., Memphis—The Clover Farm Dairy Co., 789 Union Ave., is having plans prepared for the construction of a dairy and ice cream plant on Somerville St. Estimated cost, $250,000. W. T. Tinn, Philadelphia, Pa., Archt.

Tenn., Nashville—The U. S. Biscuit Co., Memphis, plans to build a plant here. Estimated cost, $300,000.

MIDDLE WEST

Ill., Chicago—The Central Wet Wash Laundry Co., 3942 North Central Park Ave., will soon award the contract for the construction of a 1 story, 50 x 125 ft. addition to its laundry. Estimated cost, $25,000. Ronneberg, Pierce & Hauber, 10 South La Salle St., Archts.

Ill., Chicago—The Lawrence Ice Cream Co., West 21st St., has awarded the contract for the construction of a 2 story, 219 x 250 ft. ice cream factory on 21st and Sangamon Sts.

Mich., Delray (Detroit P. O.)—The Inland Delray Salt Co. plans to build a 3 story, 140 x 170 ft. salt factory. Estimated cost, $60,000. Stahl & Kinsey, 435 Woodward Ave., Detroit, Archts.

O., Alliance—The Alliance Brick Co., Sebring Rd., plans to build a plant.

O., Cleveland — The Commerci l Bookbinding Co., 2331 West 110th St., plans to build a 3 story plant. Estimated cost, $100,000.

O., Cleveland — The Cottage Creamery Co. will soon award the contract for the construction of a 1 story, 20 x 49 ft. addition to its plant at 505 Woodland Ave. Estimated cost, $10,000. J. K. Arnold, 505 Woodland Ave., Secy. A. F. Janowitz, 716 Euclid Ave., Archt.

O., Cleveland — The Ward Baking Co., 1500 Superior Ave., has awarded the contract for altering its 1 story plant. Estimated cost, $20,000. Private plans.

Wis., Merton—The Merton Dairy Products Co. has awarded the contract for the construction of a 1 story, 30 x 45 ft. addition to its creamery. Estimated cost, $18,000. Noted Sept. 10.

Wis., Milwaukee — W. H. Devos & Co., 32d and Concordia Sts., will build a 2 story, 50 x 125 ft. factory on 31st St. for the manufacture of concrete blocks. Estimated cost, $10,000.

WEST OF THE MISSISSIPPI

Col., Denver—The Federal Glass Co., 1717 Champa St., is having plans prepared for the construction of a plant to include an office building, circular glass house, 100 ft. across, factory building with 10,000 sq.ft. of floor space and gas plant. Estimated cost, $250,000. Noted Sept. 2.

Col., Denver—The Great Valley Sugar Corp., 800 Central Savings Bank Bldg., is having preliminary plans prepared for the construction of 3 complete sugar factories, 2 in Weld County and 1 in Boulder County. Estimated cost, $3,000,000. A. F. Lyster, 800 Central Savings Bank Bldg., Engr.

Col., La Salle — The Industrial Sugar Co., Barclay Block, Denver, has awarded the contract for the construction of a sugar factory here. Estimated cost, $1,800,000.

Kan., McPherson—The Goerz Flour Co. has awarded the contract for the construction of a 7 story, 48 x 120 ft. mill and a 2 story, 48 x 116 ft. warehouse. Estimated cost, $600,000.

Mo., North Kansas City—The Hoover & Allison Co., Armour Rd. and Forest St., manufacturers of cordage, has awarded the contract for the construction of a 1 story, 80 x 362 ft. factory.

Tex., Ballinger—C. S. Guin plans to build an ice plant. Estimated cost, $50,000.

Tex., Dallas — The Pure Ice and Cold Storage Co., Marilla and Harwood Sts., plans to build and equip an addition to its ice plant. Estimated cost, $20,000.

Tex., Ft. Worth—The Texas Cotton Mills Co. plans to build a cotton mill to house 15,000 spindles and about 500 looms. Estimated cost, $1,000,000.

CANADA

N. S., Windsor—T. B. Akins, of Windsor, and Wright & Jodfrey, of Wolfville, are interested in company which plans to build a pulp mill, etc. About $250,000.

Ont., Petrolea—E. A. Stokes plans to build and equip a plant for the manufacture of nitroglycerine. Estimated cost, $100,000.

Que., Montreal — The Knit to Fit Mfg. Co., Ltd., 322 Pahineau Ave., has awarded the contract for the construction of 4 story, 136 x 196 ft. factory on Parthenais St. Estimated cost, $178,000.

Business Opportunities—Employment

See Pages 272 to 297 **SEARCHLIGHT SECTION** See Pages 272 to 297